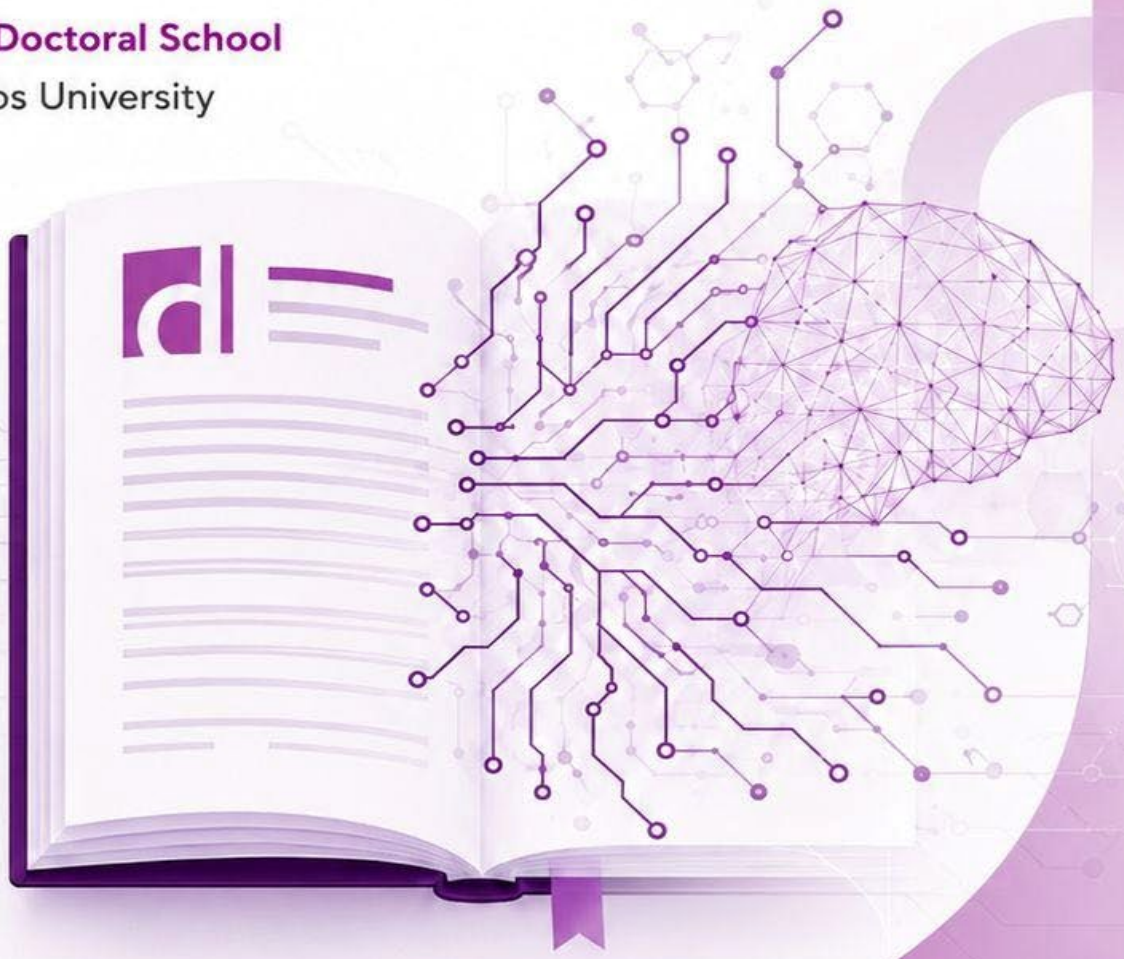
URJC | Escuela Internacional de Doctorado

GUIDE TO GOOD PRACTICES

IN THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE IN DOCTORAL RESEARCH

International Doctoral School
Rey Juan Carlos University



Universidad Rey Juan Carlos

Escuela Internacional de Doctorado

GUIDE TO GOOD PRACTICES IN THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE IN DOCTORAL RESEARCH

Document unanimously approved by the Governing Council of the Rey Juan Carlos University in ordinary session of May 29, 2026 (Item 18 of the agenda)

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I

PREAMBLE

In doctoral studies, not only the final result (the thesis) is evaluated: the research process, the results achieved, the critical capacity and the scientific contribution are also assessed. In short, what is evaluated is the ability to generate original and relevant knowledge in an ethical, autonomous and rigorous manner. The doctoral thesis is the mandatory final outcome that stands as formal proof that such original knowledge has been generated, that a methodology has been mastered, that the discipline itself is understood in depth, and that the candidate is capable of conducting independent research.

Generative Artificial Intelligence (AI) is transforming all phases of the research process, from information searching to data analysis and the writing of results. It is true that the use of this technology brings significant benefits to research –within limits–: among others, it automates and accelerates scientific work (e.g., it facilitates literature searches, systematises information and streamlines methodological tasks; it is particularly useful in metadata analysis, in the processing of large volumes of information and in pattern discovery) and increases productivity (e.g., it allows hypotheses to be generated, relationships between variables to be explored, scenarios to be simulated and the researcher's capacity to review literature to be improved). But it can also generate risks and hazards arising from non-compliance with ethical and legal principles (privacy, transparency and integrity), cognitive dependence or weakening of critical thinking, biases, incomplete, tendentious or false responses and problems of scientific integrity.

This being so, AI must be a support tool, not a substitute for the researcher, who must always retain intellectual control over the entire process. It will be an important ally only if it is used in a strategic, ethical and conscious manner, so that it allows the capacities of research to be expanded without replacing scientific reflection.

A guide of good practices on the use of generative AI in doctoral research is essential to ensure academic ethics, scientific quality and the validity of the work. Its objective is to guarantee that research activity is carried out with integrity, transparency and respect for authorship. Thus, clear recommendations are needed in favour of an ethical, transparent and responsible use of this technology that is compatible with scientific integrity and adaptable to a changing regulatory environment, especially in view of the increase in requirements regarding integrity, data security, methodological quality and protection against biases.

These guidelines of good practices must comply with the European Commission's 2025 Guidelines (https://research-and-innovation.ec.europa.eu/document/download/2b6cf7e5-36ac-41cb-aab5-0d32050143dc_en?filename=ec_rtd_ai-guidelines.pdf) on the responsible use of generative Artificial Intelligence in research, which insist that the use of AI in this field

must align with the core values of scientific integrity –especially honesty, transparency, respect and responsibility– and which recommend that each institution develop an internal stance and policies based on these principles to guide its researchers.

The European Commission acknowledges that the regulatory environment relating to AI is changing rapidly, which is why it proposes that Universities and Research Centres adopt internal frameworks based on adaptable and solid principles that ensure a coherent and safe use of AI. Universities need policies based on honesty, transparency and responsibility because AI poses real risks to the quality of academic work if it is not properly regulated and managed. The existence of an institutional stance serves as a basis for training researchers, for adjusting administrative and methodological processes, for ensuring coherence throughout the institution and for generating trust in the use of AI in science.

Given that AI has not only changed the way knowledge is produced, but also the way it is supervised and evaluated, this Guide of Good Practices of the International Doctoral School of Universidad Rey Juan Carlos (URJC) is addressed not only to researchers in training, but to all agents involved in the training process of URJC's Doctoral Programmes, since limiting the recommendations to doctoral candidates would create asymmetries and gaps and, consequently, would result in an incomplete guide. For the use of this technology to be ethical, coherent and transparent, it is necessary that all the roles intervening in this academic ecosystem understand their responsibilities, limits and good practices. For this reason, the guidelines apply, in addition to doctoral candidates, to: a) their supervisors and tutors, insofar as they can guide the responsible use of AI and are the first to review their work; b) external evaluators, as interpreters of the declared use of AI tools and as evaluators of originality; c) members of defence panels or evaluation committees, in their role as interpreters of authorship and of the scientific contribution of doctoral research; and d) members of academic committees, as persons competent to establish institutional policies consistent with this Guide.

This Guide is intended as a tool that reflects the intention of the International Doctoral School of URJC to comply with the European Commission's recommendation to provide clear rules or recommendations, training in processes and institutional support so that researchers know how to use generative AI in a regulated and constantly changing environment. Its objective is to provide guidelines that help to ensure reliable, ethical and high-quality research, protected against errors, biases or misuse of AI that may affect the institutional reputation and the reliability of scientific work. Adopting the recommendations of the European Commission is not only a technical or ethical matter: it is a strategic decision to protect institutional quality, ensure regulatory compliance and strengthen the research competitiveness of the International Doctoral School of URJC, in addition to allowing the University to reduce legal, ethical and reputational risks. In short, the publication of this Guide positions URJC as a benchmark of good practices in the responsible adoption of AI, which will boost its capacity to attract talent and competitive

funding by ensuring that its scientific output is reliable, verifiable and fully attributable to its researchers.

This document is the result of the work developed by the *Commission for the elaboration of a Guide on the Good Use of Generative Artificial Intelligence in the development of doctoral theses*, formally established on 4 February 2026 at the initiative of the Standing Committee of the International Doctoral School (ordinary session of 19 January 2026) with the following composition:

- Ms. Elena Battaner Moro. Full Professor. Vice-Dean of Research and Library of the Faculty of Arts and Humanities (URJC).

- Ms. Elisabet Huertas Hoyas. Associate Professor. Secretary of the URJC Research Ethics Committee.

- Ms. María del Mar Moreno Rebato. Associate Professor. Deputy to the University Ombudsperson (URJC). Member-researcher of CETINIA.

- Mr. Francisco Antonio Serrano Acitores. Associate Professor. Coordinator of Digitalisation, Innovation and Communication of the Faculty of Legal and Political Sciences (URJC).

- Ms. Vanessa García Herrera. Associate Professor. Academic Secretary of the EID (URJC). Chair of the Working Group.

The working group has acted collegially, agreeing the ethical, methodological and technical criteria contained in the document.

The Commission undertakes to update this Guide periodically so as to adapt it to the development of generative AI technologies and to the applicable regulations at any given time.

II

GUIDING PRINCIPLES FOR THE RESPONSIBLE USE OF AI IN DOCTORAL RESEARCH

1. Introduction

The incorporation of AI tools –and, in particular, of generative AI– into research processes constitutes an opportunity to strengthen analysis, productivity and scientific innovation. Nevertheless, its use requires rigorous attention to the ethical and legal principles that govern research activity, especially in the context of doctoral training.

The use of AI must be regarded as a support instrument, never a substitute for intellectual responsibility, scientific authorship or the critical judgement of the researcher. The use of these technologies must respect the fundamental values that underpin academic integrity: reliability, honesty, respect and responsibility.

In the doctoral field, the use of AI systems must be legal, ethical and technically robust, complying with the regulations in force on data protection, intellectual property, confidentiality, bioethics and any other applicable normative provision. Likewise, all use of AI must comply with the principles of respect for human rights and non-discrimination, as well as for cultural and gender diversity. Its application will only be appropriate when it responds to a legitimate purpose and after its possible technical, social and academic risks have been assessed in accordance with the principle of proportionality. Lastly, effective human supervision must be guaranteed throughout all phases of the research process, since the ultimate responsibility for the methodological design, the analysis, the interpretation of results and the writing of the work always lies with the researcher.

The use of generative AI systems in doctoral research must comply with the principle of sustainability, in coherence with the 2030 Agenda for Sustainable Development and, in particular, with the Sustainable Development Goals (SDGs) relating to quality education (SDG 4), responsible innovation (SDG 9), responsible production and consumption (SDG 12) and climate action (SDG 13). In this regard, the use of such technologies must expressly consider its environmental, technological, economic and institutional impact, especially as regards the consumption of computational and energy resources. Consequently, generative AI tools should only be used when their application proves necessary, proportionate and duly justified in light of the scientific objectives of the doctoral work, avoiding repeated, superfluous or merely substitutive uses of human reasoning and intellectual elaboration. Likewise, all agents involved in the doctoral research process must promote an efficient, rational and responsible use of AI, integrating criteria of resource optimisation, social responsibility and coherence with the values of sustainability, good governance and responsible scientific production that inspire the 2030 Agenda and the SDGs.

This Guide draws on the main International Instruments of ethical guidance on AI developed in recent years. Among them, the following stand out: the *Ethics Guidelines for Trustworthy Artificial Intelligence*, drawn up by the High-Level Expert Group on AI of the European Commission (April 2019), the *Recommendation on the Ethics of Artificial Intelligence*, adopted by UNESCO (November 2021), and the *Living Guidelines for Researchers on the Responsible Use of Generative Artificial Intelligence*, developed by the European Commission and the European Research Area Forum (second edition, 2025). These references shape the conceptual and normative basis of the following principles.

2. Basic ethical principles

- Reliability. The use of AI requires ensuring the validity and reproducibility of the results generated. The researcher must verify the accuracy of the responses, must be able to identify possible technological biases and must be able to guarantee that the technology employed does not compromise the quality of the design, methodology or analyses of the study.

- Honesty. Transparency is an essential requirement. The use of generative AI tools must be expressly reported, specifying the name of the tool, the version used and the specific way it has been employed. If the use of AI significantly influences the obtaining or interpretation of results, such information must be incorporated into the methodology of the doctoral work.

- Respect. The research process must take place within a framework of respect for the university community, the participating individuals, the institution and society as a whole. The use of AI must safeguard the rights related to privacy, confidentiality, intellectual property and data protection, in accordance with the legislation in force.

- Responsibility. The researcher must fully assume the consequences arising from the research process. This implies exercising rigorous human supervision of the use of generative AI in such a way that the authorship, academic integrity and scientific coherence of the final work can be guaranteed.

3. Specific ethical principles

In order to move from the basic principles that guide the general use of AI in research towards a more precise set of recommendations, it is necessary to introduce ethical principles that delve deeper into the obligations, responsibilities and safeguards that must guide the research community in this matter. While the basic ethical principles establish the general foundation for an appropriate and conscious use of these technologies, the specific ethical principles develop in greater detail the moral, legal and methodological

implications that guarantee the integrity of the research process and the protection of the essential values of scientific practice.

3.1. Principle of scientific integrity, originality and authorship

Scientific integrity constitutes the central axis of all research activity and reflects the commitment to honesty, methodological coherence and truthfulness. In the context of the use of AI systems, this principle requires that research work continue to be based on critical reflection, the researcher's own reasoning and the original production of knowledge.

Generative AI may be employed as an auxiliary tool –for example, in the preliminary review of texts or in support for conceptual exploration–, but it cannot replace hypothesis validation, the interpretation of results or the intellectual elaboration that underpins scientific authorship. In this way, both the credibility of academic work and the authenticity of the research process are protected.

3.2. Principle of transparency and traceability

Transparency implies the obligation to identify and communicate explicitly any use of AI throughout the research process. Traceability, closely linked to this principle, requires that such use be systematically documented, so that it can be reviewed, reconstructed and understood by third parties. Incorporating these elements ensures that the researcher's contributions can be clearly distinguished from those generated through automated systems, thereby preventing AI from functioning as a "black box" and ensuring a responsible, conscious and verifiable exercise of its use.

3.3. Principle of responsibility and accountability

Since AI systems lack legal personality and therefore their own legal responsibility, ultimate responsibility for their use lies exclusively with the persons who employ them. This principle reaffirms the need to maintain human critical judgement as an indispensable element in all phases of academic work.

Accountability ensures that methodological decisions can be justified and replicated before the scientific community and that the final product meets criteria of rigour and coherence.

3.4. Principle of academic autonomy and meaningful human control

Academic autonomy requires that research strengthen the researcher's fundamental capacities such as creativity, independent judgement, analytical ability and complex reasoning. AI can facilitate certain technical or mechanical tasks, but it must not replace the substantive intellectual activity inherent to the training process and to the generation of knowledge.

Meaningful human control implies that the researcher retains at all times the ultimate authorship over the interpretation of information, decision-making and the elaboration of conclusions. This principle takes on special relevance in doctoral training, where autonomous learning constitutes a fundamental objective.

3.5. Principle of data protection and confidentiality

The ethical treatment of personal data and sensitive information is an essential component of academic work. In the use of generative AI, safeguards must be implemented to ensure respect for the applicable legislation on privacy, intellectual property rights and institutional or individual confidentiality.

This principle establishes that no data should be entered into AI tools whose security, control or deletion cannot be guaranteed. Its correct application protects individuals' privacy, preserves legal certainty and reinforces the reputational integrity of the institutions involved.

3.6. Principle of justice, equity and non-discrimination

Generative AI models, being trained on large volumes of data, may reproduce patterns of bias or generate discriminatory content. For this reason, it is necessary to incorporate mechanisms of critical evaluation that allow these risks to be identified, mitigated and corrected.

The inclusion of this principle guarantees that research does not contribute, either voluntarily or involuntarily, to the reproduction of stereotypes, structural inequalities or epistemic biases, especially in contexts involving vulnerable populations or sensitive topics.

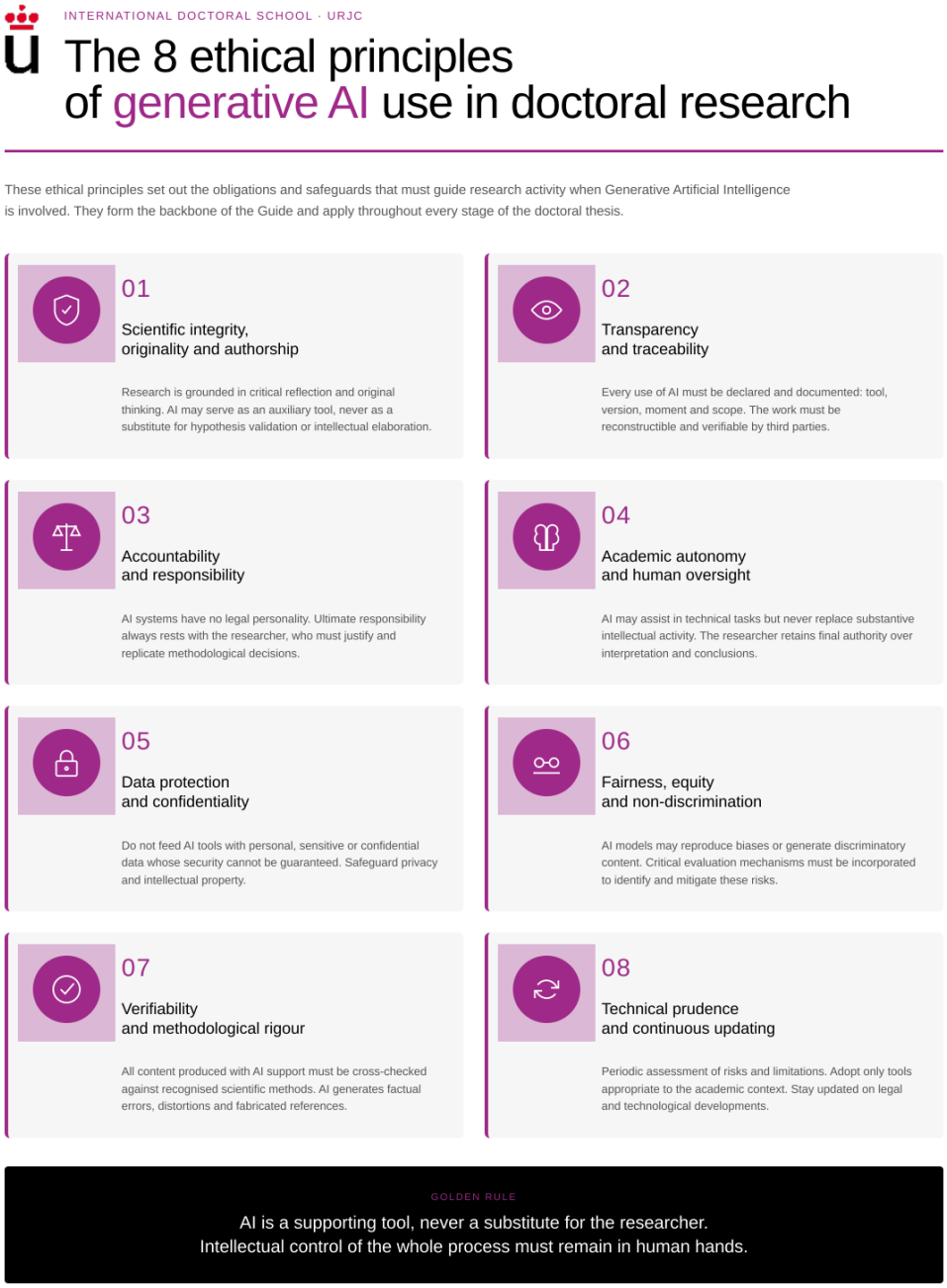
3.7. Principle of verifiability and methodological rigour

Verifiability requires that all contents, analyses or results generated with the support of AI be cross-checked through recognised scientific methods. Generative AI may produce factual errors, argumentative distortions or non-existent references, which makes a process of systematic validation by the researcher essential. This principle preserves the methodological soundness of academic work and prevents the circulation of unreliable information, contributing to the maintenance of the quality standards proper to university research.

3.8. Principle of technical prudence and continuous updating

The constant evolution of AI technologies requires an approach based on technical prudence. This implies periodically assessing the risks and limitations of new tools, ensuring they meet minimum security and reliability standards, and adopting only those that prove appropriate for the academic context. Likewise, periodic updating of the Guide

will ensure that the recommendations do not become obsolete in the face of legislative changes, new methodologies or technological advances.



Infographic produced with the support of the generative AI tool Claude (Anthropic)

III

GOOD PRACTICES

1. Introduction

The ethical principles set out above constitute the foundation upon which a responsible use of AI in the doctoral field must be based. However, for them to be effectively applied in research practice, it is necessary to translate them into concrete guidelines that direct the daily activity of doctoral candidates, supervisors, tutors, academic committees, external evaluators and members of thesis committee. Coherence between the ethical framework and practical actions not only reinforces a culture of academic integrity, but also ensures that methodological decisions, the handling of data and scientific writing are carried out in accordance with the values that govern the institution.

The good practices presented below constitute the implementation of the principles of transparency, rigour, responsibility and respect for authorship, as well as of the ethical and legal obligations associated with research. Their function is to offer clear and verifiable guidelines that allow the doctoral candidate to integrate AI into their work in a conscious, critical manner and in accordance with academic standards, while at the same time providing supervisors, tutors and other evaluating bodies with objective criteria to oversee their implementation. In short, they should be understood as a natural extension of the ethical framework aimed at ensuring the quality, integrity and reliability of doctoral research.

2. Good practices for doctoral candidates

2.1. Good practices in the use of generative AI in the structure and planning of the doctoral thesis

1. Use AI as initial support, not as a substitute for intellectual design. Generative AI can help to generate initial drafts of structure, to identify subtopics or to suggest interdisciplinary approaches, but the definitive design of the thesis must be elaborated by the researcher.

2. Always maintain critical control and human validation. Any structural suggestion, conceptual map or proposed organisation generated by AI must be critically reviewed by the doctoral candidate. AI does not know the real context of the research or the specificities of the academic field, and may therefore propose superficial or inappropriate structures.

3. Expressly declare the use of AI. Academic transparency requires the declaration of the generation of initial conceptual maps, of proposals of structure and of the preliminary identification of approaches or topics.

4. Avoid algorithmic dependence. Although AI accelerates the initial stage, excessive use may produce automation biases, standard structures or reductionist approaches that limit the originality of the project. It is important to avoid hidden biases derived from relying too much on AI.

5. Always verify the conceptual coherence of the proposals generated. AI may mix disciplinary perspectives or propose methodological connections without scientific foundation. The researcher must check that the proposed structure reflects the true object of study, that the chapters follow a logical and rigorous order, and that the conceptual relationships suggested have real academic support.

6. Use AI to accelerate initial understanding, not to replace the review of bibliographic sources. In the planning phase, AI may synthesise large volumes of references or point out trends, but these suggestions must be verified against the original sources and against reliable academic databases to avoid hallucinations or selection biases, such as prioritising the most recent or most cited works.

7. Use AI to generate preliminary drafts of structure, not the final version. The final version of the structure must reflect the researcher's personal analysis, the internal logic of the project and the intellectual originality required in a thesis. AI should only serve as a generator of initial options.

8. Protect authorship and prevent AI from unduly influencing the focus of the research. AI must not define the object of study or delimit the research questions, since this compromises intellectual authorship. Decisions about what to investigate and how to structure the research must be exclusively human.

9. Document the decision-making process. It is advisable to record what was asked of the AI, what the tool returned and what was accepted, modified or discarded and for what reason. This traceability protects the researcher against doubts of authorship or of scientific integrity.

10. Always develop a critical reflection on the focus and final structure. Even when AI has been useful in accelerating the planning phase, the definitive design must show the author's reasoning, creativity and intent, which are essential principles for academic quality and the originality of the doctoral thesis.

2.2. Good practices in the use of generative AI in the search for ideas or concepts

1. Use AI as an initial support tool, never as a substitute for research. AI can help to synthesise information, to detect patterns in the bibliography or to propose thematic approaches, but these functions must be regarded as preliminary suggestions, not as

definitive results. The researcher must analyse, validate and reformulate any idea generated.

2. Always verify the references, patterns and ideas suggested. AI may invent citations, references or authors, may mix results from different articles and may even prioritise recent bibliography, the most cited or that written in English. For this reason, no generated reference should be used without performing the appropriate check in validated academic databases (Scopus, Web of Science, Dialnet, etc.).

3. Maintain constant critical supervision. It is essential to review with academic criteria the syntheses or groupings of bibliography produced by AI, since they may contain hidden biases, oversimplify complex concepts and establish conceptual relationships that do not exist in the actual bibliography.

4. Use AI to accelerate initial access to large volumes of information. Among the appropriate uses are: producing thematic summaries, identifying trends in research lines, exploring bibliography grouped by methodological approaches and obtaining initial translations to understand materials in other languages. These uses speed up the first approach to the state of the art, but always require reading the original texts.

5. Avoid directly transferring AI-generated content to the academic manuscript. Content produced by AI is not original, nor can it be considered a scientific creation. It must be treated solely as support for generating new ideas and as a stimulus for the doctoral candidate's critical thinking, never as text to be incorporated directly.

6. Declare the use of AI in conceptual search and exploration. The use of AI must always be declared, indicating which tools were used and in what type of activities (initial summaries, identification of trends, thematic grouping, preliminary translations).

7. Maintain originality and avoid the risk of academic fraud. Ideas generated by AI cannot substitute for the researcher's intellectual creativity. Originality must come from the doctoral candidate's personal analysis; the tools can only provide initial inputs, never complete or closed approaches.

8. Complement AI with traditional academic tools. To ensure rigour, references must be validated using bibliographic managers, real scientific databases must be consulted and the original texts must always be read and contrasted. This triangulation minimises errors and ensures reliability.

9. Protect the integrity of the bibliography and avoid incorrect attribution of authorship. The researcher must ensure that every reference included has been verified, avoiding the attribution of invented or mixed authorships generated by AI.

10. Use AI to stimulate reflection, not to define the direction of the research. AI may suggest topics, connections between concepts or possible frameworks, but the meaning,

scope and final orientation of the research must be decided exclusively by the doctoral candidate. AI must not displace the candidate's own reflection or research autonomy.

2.3. Good practices in the use of generative AI in writing and style

1. Maintain human authorship of all content. AI must not write content. The creation of original text is a non-delegable responsibility of the researcher and constitutes a legal requirement of authorship under intellectual property law. Using AI to generate complete sections compromises originality and may constitute academic fraud.

2. Use AI only as support for improving style. AI may be employed for tasks of grammatical and spelling correction, for clarity adjustments and to achieve a homogenisation of the academic tone, always starting from a text previously written by the doctoral candidate. The role of AI must be to "refine", never to "create".

3. Preserve the candidate's own academic voice. A style generated by AI may turn out to be excessively homogeneous or standardised, which could raise doubts of false authorship before the supervisor, tutor, Academic Committee, evaluators or members of the thesis defence panel. The text should be reviewed to ensure it maintains coherence with the author's usual style, their own nuances and a personal argumentative reasoning.

4. Always declare the use of AI in stylistic tasks. The use of AI must be declared in the name of transparency, even when it is limited to corrections or adjustments. The tools used, the type of corrections performed and the scope and limitations of their intervention must be indicated.

5. Avoid texts generated from scratch through prompts. The automatic generation of text does not constitute intellectual creation, so it is not attributable to the researcher, cannot be considered original work and, consequently, does not meet the standards of authorship required in a doctoral thesis. Only text fully written by the researcher should be used as a basis for any review.

6. Critically review AI's suggestions. AI may introduce subtle errors, change the technical meaning of sentences and apply inappropriate style. For this reason, every modification suggested by AI must be reviewed by the researcher to ensure that it does not alter the conceptual or scientific accuracy of the text.

7. Avoid the loss of writing skills. Excessive use of AI may cause cognitive atrophy in writing. The doctoral thesis is a test of the candidate's analytical, expressive and argumentative capacity: delegating to AI may compromise the acquisition and demonstration of those competences.

8. Protect narrative coherence and argumentative logic. Since AI may generate decontextualised fragments, it is important to check that the thread of argument is maintained, that the academic narrative follows a logical order and that no stylistic ruptures are introduced.

9. Use AI for small improvements in clarity, never to rewrite long blocks. Polishing sentences, simplifying syntactic structures or improving readability is appropriate. By contrast, rewriting whole paragraphs with AI may dilute authorship and alter the scientific meaning of the text.

10. Guarantee linguistic and terminological integrity. AI tools may replace technical terms with inaccurate synonyms, eliminate essential nuances in academic expressions and introduce undue simplifications. It is essential to verify that the scientific vocabulary is kept intact.

2.4. Good practices in the use of generative AI in the technical framework

1. Use AI only as a support tool, not as a source of scientific grounding. AI may help to generate preliminary approaches to the state of the art, to conceptual frameworks or to connections between theory, methodology and application, but it cannot replace real scientific or bibliographic grounding. The final version of the technical framework must always be built on verified academic bibliography.

2. Declare the use of AI. The use of AI for support tasks in the technical framework must be declared (e.g., preliminary review of bibliography, comparison of theoretical frameworks and generation of conceptual maps or of initial conceptual approaches).

3. Manually verify all information provided by AI. Although AI can synthesise texts, propose conceptual classifications or explain theories, its results must be validated by the researcher, since it may oversimplify complex concepts, provide incorrect definitions or combine elements from different authors without precision.

4. Prevent AI from generating the main technical discourse. The technical framework requires depth, conceptual rigour, detailed understanding of the state of the art and critical interpretation. These elements cannot be delegated to AI, which lacks legal personality and responsibility and, consequently, cannot be considered an author. The construction of the conceptual discourse must be entirely human.

5. Use AI to explore connections, but not to define them. AI may suggest links between theories, methodological approaches or applications, but the doctoral candidate must validate whether those connections really exist in the bibliography, must support each relationship with verified academic citations and integrate them only if they make theoretical sense in the corresponding field.

6. Critically review comparisons and syntheses generated by AI. Comparisons between theoretical or methodological frameworks generated by AI may be useful as a starting point, but they may also omit fundamental nuances, mix incompatible disciplinary currents or omit relevant discrepancies in the bibliography. The researcher must always rework them.

7. Guarantee conceptual integrity and respect for intellectual property. AI does not guarantee accuracy or originality; therefore generated text must never be incorporated directly into the research work, AI must never be used to produce final technical definitions and any content that bypasses consulting the original studies must be avoided.

8. Employ AI to speed up synthesis or visualisation tasks, without substituting reasoning. In the technical framework, AI may serve to generate preliminary outlines, to order ideas, to visualise conceptual relationships and to suggest possible lines of connection. But the review, rewriting and validation must be intellectually human.

9. Preserve the researcher's own logical coherence and conceptual structure. The technical framework must reflect a solid and consistent vision constructed by the researcher. AI, if used uncritically, may introduce generic or inconsistent structures that dilute the candidate's own academic voice.

10. Maintain control over the process of theoretical construction. The researcher must choose which theories are relevant and why, explain the reason for including certain approaches, justify the relationship between theory, methodology and application, and ensure that the technical framework directly responds to the research questions. AI must not determine or define this conceptual architecture.

2.5. Good practices in the use of generative AI in methodology

1. The methodology must be designed entirely by the doctoral candidate. The methodological conception is an essential element of authorship. AI must not design or decide the research method; it cannot select techniques, define procedures or build complete methodological models. AI may generate incorrect, inapplicable or excessively simplistic methodologies, compromising the validity of the work.

2. Use AI only for auxiliary tasks, not to define the method. In this phase, AI may only be employed to translate relevant texts, to review bibliography related to methodologies, to synthesise existing approaches and to create conceptual maps or visualisations of methods. But the final methodological decision must always be human and reasoned.

3. Explicitly declare the use of AI. The use of AI must be transparent, especially if it was applied in tasks such as bibliography reviews, method syntheses, generation of code for analysis or creation of visual schemes or diagrams. The declaration does not detract value; it demonstrates digital competence, ethics and responsibility.

4. Review and verify any code, formula or procedure suggested by AI. AI may generate erroneous code, inappropriate statistical tests or deceptively coherent but methodologically incorrect procedures. These errors may produce results that appear to be correct but are invalid.

5. Ensure coherence among methodology, theory and objectives. AI may provide suggestions that are not coherent with the research question, with the theoretical

framework or with the type of data available. For this reason, the researcher must ensure methodological integration on the basis of their own academic judgement.

6. Maintain the principle of methodological responsibility. AI has no responsibility, so all decisions must fall on the researcher, who must justify each technique selected, validate its relevance and explain its limitations.

7. Avoid delegating to AI the central execution of analytical processes. Although AI may assist in data visualisation or suggest transformations, the interpretation and analysis must be entirely human. AI does not understand the context of the research and may lead to serious methodological errors.

8. Verify the ethical and legal appropriateness of the methodology. Especially when personal or sensitive data are handled, the researcher must comply with data protection regulations, avoid introducing confidential data into unauthorised AI platforms and guarantee research ethics standards.

9. Clearly explain the tasks in which AI has been used. The methodology section must include a specific subsection indicating which AI tools were used, in what methodological tasks, what limitations they present and what human supervision was applied.

10. Protect methodological integrity and avoid artificial shortcuts. AI must not be used to skip validation processes, to justify decisions without foundation or to create a "prefabricated" method. Methodology is the pillar that gives reliability to the study; it must be solid, logical and reasoned.

2.6. Good practices in the use of generative AI in data analysis

1. The analysis and interpretation of data must always be human. AI may help to generate graphs or visualise data, but it must not interpret the results or draw conclusions. Responsibility for interpretation lies entirely with the researcher.

2. Declare the use of AI. If AI was used to generate graphs, to format tables, to prepare visualisations or to suggest code, the tool must be declared and cited as editor, not as author.

3. Critically review any numerical, statistical or computational *output* generated by AI. AI may choose the wrong statistical tests, generate code with subtle errors, produce "apparently correct" but methodologically invalid results, or fail to understand the limitations of the data or the context. For this reason, every calculation must be reviewed manually or with specialised tools.

4. Avoid delegating to AI methodological decisions related to data. The choice of statistical techniques, tests, models or analytical procedures must be justified by specialised bibliography and be coherent with the methodology of the thesis. AI may serve as support, but must not decide the analytical methods.

5. Ensure reliability through cross-validation of the analysis. It is recommended to validate the results in recognised statistical software, to compare AI *outputs* with manual or semi-automatic analyses and to verify statistical assumptions (normality, homoscedasticity, etc.). AI does not understand these assumptions and may ignore them.

6. Control the biases introduced by AI during the analysis. AI may distort the interpretation or prioritise more frequent patterns, central values and incomplete or poorly structured data. The researcher must check that the analysis does not incorporate algorithmic biases.

7. Protect personal and sensitive data. If the data include personal information, data protection regulations must be observed: sensitive or confidential data must not be entered into unauthorised AI tools, personal data must be anonymised beforehand and secure platforms approved by the Institution must be used.

8. Use AI only for technical support tasks. Permitted tasks include the creation of graphs, the formatting of tables, the structuring of datasets and the generation of initial code (always reviewed). AI must be used as a technical assistant, not as an analyst.

9. Document the use of AI. The methodology section must describe which tools were used, for which part of the analysis, what controls were applied and what decisions were human as opposed to automatic. This provides transparency and protects academic integrity.

10. Ensure coherence between data, methodology and final results. AI may generate visualisations or code, but the researcher must ensure that the analysis responds to the objectives of the research, that it is compatible with the methodological design and that the data are interpreted within the theoretical and technical framework of the thesis.

2.7. Good practices in the use of generative AI in conclusions

1. Ensure that the conclusions reflect the own authorship and own critical thinking. The conclusions must be the clearest expression of the personal scientific interpretation, the result of the analysis developed throughout the thesis. The conclusions condense the individual critical interpretation, so they must be written entirely by the doctoral candidate.

2. Do not use generative AI to write the conclusions in whole or in part. Delegating the elaboration of the conclusions to generative AI tools constitutes an inadmissible practice and may compromise the authorship, responsibility, reliability of the work and academic honesty.

3. Use AI only for minor tasks of formal support. In this section, very limited use of AI is recommended; specifically, its use is allowed for small spelling reviews, for performing a grammatical review and for making micro-adjustments of clarity. AI may not synthesise, rewrite or reorganise the conclusions.

4. Demonstrate in the conclusions the doctoral candidate's capacity for synthesis. The conclusions must show the researcher's ability to synthesise results, to integrate findings, to offer a rigorous interpretation and to connect the results with the conceptual and methodological framework. This process constitutes a direct demonstration of advanced cognitive competences.

5. Ensure that the conclusions derive solely from the results presented. Unfounded assertions, excessive extrapolations or ideas not previously developed must be avoided. The conclusions must be based only on the evidence presented, on the analysis carried out and on the frameworks previously defined; in other words, they must reflect the result of the research, not new ideas suggested by AI. A good practice is to review the initial objectives, the research questions and the key results to ensure that the conclusions respond logically and clearly to all of them.

6. Avoid standardisation or lack of personal style. The inappropriate use of AI may generate standardised texts that betray a lack of authorship. It is essential that the style of the conclusions matches the rest of the manuscript and the researcher's natural style.

7. Transparently declare any use of AI. Even if AI is used only for minor corrections, it must be declared on principles of transparency and responsibility.

8. Maintain integrity, honesty and scientific quality. Delegating the creation of the conclusions to AI would compromise reliability, scientific quality, respect for the principle of honesty and integrity in the face of academic fraud. For this reason, human authorship must be absolute in this section.

2.8. Good practices in the use of generative AI in the review of the manuscript

1. Use generative AI only as a linguistic support tool. AI may be useful for performing spelling and grammatical corrections, for making improvements in clarity and for carrying out polishing of technical style, always on texts that have been drafted by the doctoral candidate.

2. Prevent AI from rewriting complete content. An extensive rewriting may generate changes of style that do not match the researcher's voice and this may cast doubt on their originality. For this reason, AI must not produce alternative versions of entire chapters or reformulate critical arguments.

3. Maintain stylistic coherence throughout the manuscript. The review must ensure that the academic style is homogeneous, that the sections have continuity and that no "standardised" tone characteristic of AI appears. A unpersonal style may give rise to suspicions of false authorship.

4. Always declare the use of AI. For the sake of transparency, it must be declared whether AI has been used, in which parts and for what purpose (correction, sentence reorganisation, clarification…).

5. Do not allow AI to structure or reorganise the complete manuscript. The structure of the manuscript responds to the researcher's logic, reflects their capacity for scientific organisation and must in no case be replaced by automatically generated structures. AI may suggest improvements in coherence, but not design the final structure.

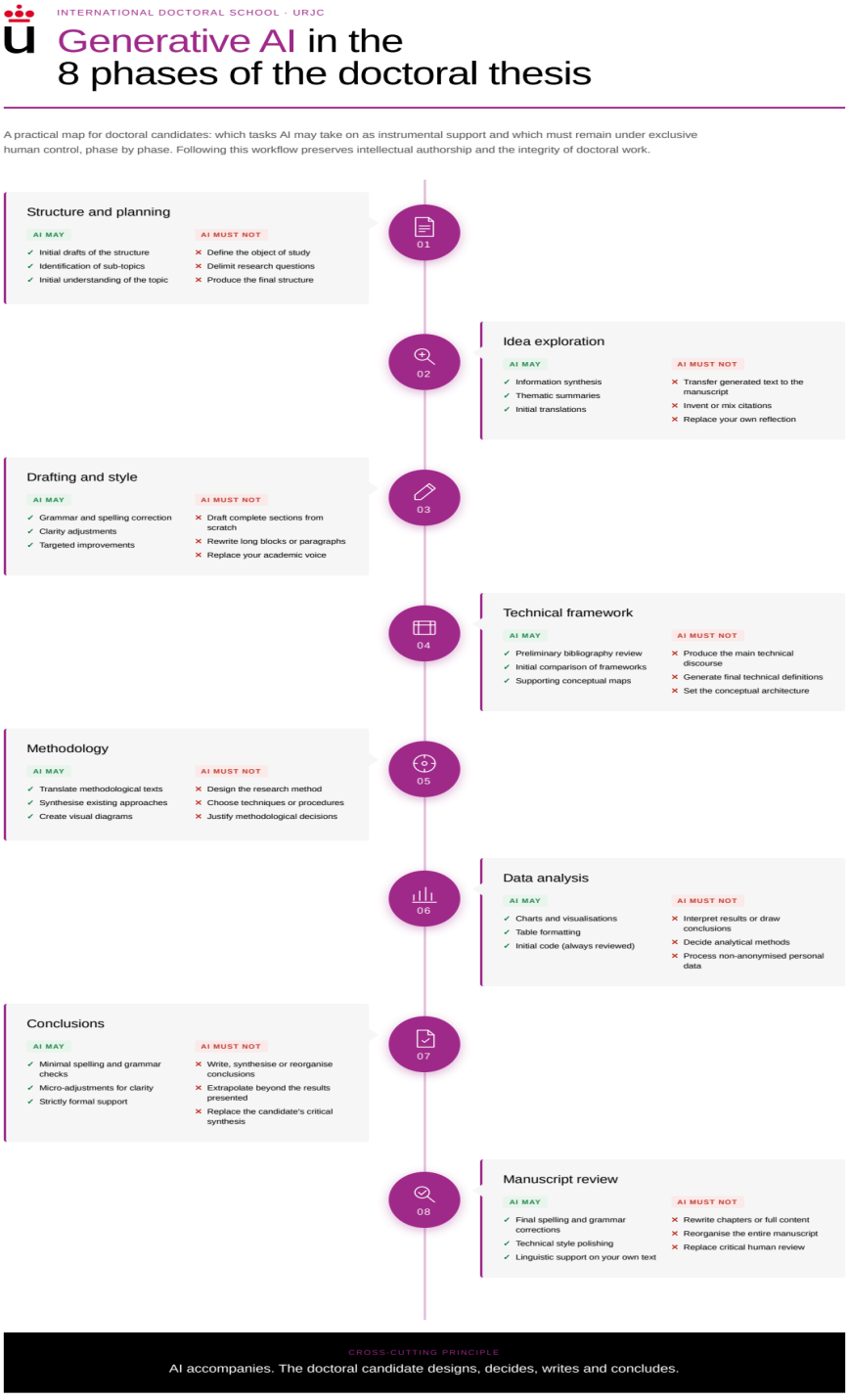
6. Critically review all changes suggested by AI. The researcher must check that AI does not eliminate important nuances, that it does not change the conceptual meaning, that it does not introduce technical errors and that it does not over-simplify academic formulations.

7. Avoid depending on AI for the integral review. The review of the manuscript is also an academic competence: it improves scientific quality, demonstrates control over the content and strengthens cognitive skills. Excessive delegation to AI may generate cognitive atrophy / excessive dependence.

8. Ensure terminological consistency. AI may change technical terms for inadequate synonyms, alter conceptual accuracy or modify specialised vocabulary. Every change must be preserved within the academic rigour of the field.

9. Verify fidelity with respect to sources and references. Although AI should not intervene in academic content, if in the review it suggests changes to sentences citing authors, the researcher must review the citation, verify correspondence with the source and confirm that the original meaning is not altered.

10. Maintain total control over the final version of the manuscript. The final version of the thesis must be the exclusive result of human review, of the author's critical validation and of consciously created internal coherence. AI may provide support, but must never direct or transform the final version.



Infographic produced with the support of the generative AI tool Claude (Anthropic)

3. Good practices for supervisors and tutors

1. Guarantee the preservation of human authorship. Supervisors and tutors must remind the doctoral candidate that AI cannot write parts of the thesis, that it cannot be considered an author or co-author, and that the work must demonstrate the researcher's creativity and original thinking. It is the responsibility of supervisors and tutors to reinforce this principle from the beginning of the process.

2. Supervise that AI is used only as a support tool. AI may be employed in tasks such as the preliminary search for information, the organisation of ideas, the initial synthesis of bibliography, grammatical corrections and data visualisation, but never to produce substantive content or conclusions. It must be ensured that its use does not displace the doctoral candidate's research work.

3. Demand total transparency in the use of AI. Supervisors and tutors must require the doctoral candidate to declare every use of AI in the thesis report, specifying its purpose, detailing the tools used and describing the scope of their intervention. This ensures honesty, reproducibility and methodological clarity.

4. Reinforce the verification and validation of information generated by AI. AI may produce invented citations, erroneous combinations of academic texts, algorithmic biases, false or inaccurate statements and misleading summaries. Supervisors and tutors must recommend that doctoral candidates verify all references in reliable scientific databases, that every concept be contrasted with primary sources and that they read the original texts and not depend on AI.

5. Assess the doctoral candidate's capacity for critical thinking. Supervision must focus on ensuring that the analysis is personal, that the reasoning is deep and well-founded, that automatisms derived from AI are avoided and that there is a personal methodological reflection. It is very important that supervisors and tutors do everything possible to avoid algorithmic dependence and cognitive atrophy.

6. Carefully supervise the methodology. Supervisors and tutors must ensure that the methodology is designed by the doctoral candidate, is coherent with the objectives, is based on valid scientific bibliography and has not been structured or suggested by AI in a automatic manner. AI may propose inappropriate or erroneous methodologies; supervisors and tutors must check that these have not been adopted without critical review.

7. Ensure the correct interpretation of data. AI may select incorrect statistical tests, generate code with subtle errors and produce incorrect results. Supervisors and tutors must require the reproducibility of the analysis in reliable software, request justification for every statistical decision and ensure that data interpretation is human, not automated.

8. Review the coherence, style and authenticity of the manuscript. Supervisors and tutors must verify that the thesis maintains the researcher's own voice, that there are no

segments with an artificial or AI-standardised style and that the structures follow the author's logic. The aim is to avoid the risks of false authorship when AI is used to reorganise or rewrite complete texts.

9. Avoid approving theses with a high risk of automation. Supervisors and tutors must be alert to signs such as texts with a homogeneous and impersonal style, standardised structures, lack of analytical depth, incorrect or invented references and absence of the candidate's own argumentation. Human authorship is essential and its absence could constitute academic fraud.

10. Encourage the thesis to show real intellectual evolution. It is recommended that supervisors and tutors request evidence of the human process (intermediate drafts, outlines, methodological decisions, rewrites, previous versions, etc.). This helps to demonstrate the intellectual work of the doctoral candidate and reinforces the authenticity of the manuscript.

11[1]. Accompany the doctoral candidate in the ethical and responsible use of AI. Supervisors and tutors must provide guidance on the risks of biases, data protection, respect for intellectual property, ethical limits in research and citation and verification practices.

Supervisors and tutors play an essential role in accompanying the doctoral candidate in the ethical, responsible and legally appropriate use of AI. In this sense, it is recommended that they provide guidance not only on the risks of biases, scientific integrity, citation and verification of results, but also on critical aspects such as data protection, the confidentiality of information and respect for intellectual and industrial property.

Likewise, it is considered advisable for supervisors and tutors to assess the nature and sensitivity of the information that is going to be processed in the research, as well as the typology of the data involved, in order to guide the doctoral candidate on the most appropriate use of AI tools, including the possible use of tools with an institutional licence or the advisability of avoiding their use in certain cases.

To this end, the following indicative tiered model is proposed, conceived as a tool to support decision-making according to the risk associated with the use of AI:

Level 1. Cases in which the use of AI is inadvisable or incompatible

[1] Section included at the initiative of the URJC Head of *Information Security*, Mr. José Antonio Rubio.

It is recommended to avoid the use of AI tools, even those with a corporate licence, in situations such as:

- Processing of personal data of third parties without the corresponding legal safeguards (including, where applicable, a data processor agreement and an impact assessment).

- Inputting of information subject to confidentiality agreements with companies or other institutions.

- Processing of sensitive or classified data within research projects with specific restrictions.

Level 2. Preferred use of tools with an institutional licence

It is recommended to prioritise the use of AI tools with a corporate licence in those cases that involve:

- Research data generated in official University projects.

- Access to institutional repositories, systems or databases.

- Anonymised personal data from university studies.

- Information obtained within the framework of institutional agreements or accords.

Level 3. Permitted use of open tools, with transparency criteria

In the absence of personal data or confidential information, the use of non-corporate AI tools may be considered appropriate for:

- Search and synthesis of publicly accessible scientific literature.

- Improvement of writing and style on texts of one's own authorship.

- Generation of code applied to one's own or to non-sensitive public data.

- Translation of one's own fragments.

- Support in processes of ideation or conceptual development (brainstorming).

In these cases, it is recommended that the use of AI be transparently declared in accordance with the criteria established in this Guide.

4. Good practices for Academic Committees

1. Supervise the doctoral candidate's use of AI tools. The Academic Committees of the Doctoral Programmes must verify the correct use of AI in the doctoral thesis. They do not

evaluate the scientific content generated by this technology, but they must supervise ethical compliance, transparency and academic integrity, and they must do so precisely in fulfilment of their function of guaranteeing academic integrity.

It is the responsibility of the Academic Committees to oversee the progress of the research, to guarantee the quality and proper functioning of the programme and to verify that the ethical principles and integrity principles are complied with. This necessarily includes the supervision of the use of AI, because academic integrity is one of the elements explicitly set out in the guidelines contained in this Guide. The Committees must safeguard integrity, and integrity requires monitoring the use of AI.

This Guide requires transparency and traceability in the use of AI, which entails declaring its use, citing the tools and verifying the reliability of the sources used by the AI. Since the declaration of use must be included in the thesis report by the doctoral candidate, the Academic Committee must review it when authorising the deposit of the thesis; it must verify that the use has been declared, that there is no plagiarism or undue generation and that the content generated by AI does not replace the doctoral candidate's intellectual contribution.

2. Accompany regulatory updating. It is necessary to promote an ethical, responsible and critical culture regarding the use of AI. The Academic Committees play a key role in promoting clear and up-to-date recommendations.

5. Good practices for external evaluators

1. Verify human authorship in all substantive content of the thesis. External evaluators must ensure that the thesis demonstrates the candidate's own critical thinking, original writing, autonomous argumentative capacity and human scientific interpretation. AI cannot write content, because this entails a loss of authorship and a risk of academic fraud. They must be attentive to potential signs of improper use of AI in the writing, such as an excessively uniform and depersonalised style, unnatural transitions, artificial or standard language or abrupt changes of style between chapters.

2. Evaluate the quality and reliability of the references and citations. AI may invent, mix or alter sources. For this reason, external evaluators must check that references exist, that they match the texts cited and that they have been verified in reliable databases.

3. Assess the doctoral candidate's intellectual evolution and own work. External evaluators must verify that the thesis demonstrates academic maturity, evolution in research capacity and an in-depth understanding of the subject. This is key to preventing AI from having replaced phases of academic reasoning.

4. Evaluate the internal coherence of the manuscript. External evaluators must review that the argumentative thread is consistent, that the sections connect with each other,

that there are no contradictions between chapters and that the author's own logic is preserved. An excessive use of AI may introduce artificial structures or inconsistencies.

5. Formulate clear and well-founded recommendations based on the responsible use of AI. External evaluators may include in their report comments on the transparency of the use of AI, recommendations on ethical handling, suggestions for methodological or conceptual improvement and warnings if risks of automation are detected.

6. Good practices for members of the thesis defence panel

1. Guarantee that the thesis reflects original human authorship. The defence panel must examine whether the work presented demonstrates the candidate's own critical thinking, original writing, intellectual creativity and authentic scientific interpretation, all with a view to guaranteeing integrity and avoiding academic fraud.

2. Verify the existence of a transparent declaration of the use of AI. The defence panel must require that the thesis include a clear declaration specifying which AI tools were used, for what purpose, in which phases and with what limitations. The declaration of the use of AI is mandatory on grounds of transparency, responsibility and academic honesty.

3. Assess the doctoral candidate's ability to defend the thesis orally. The defence panel must check that the doctoral candidate clearly explains the methodological decisions, that they master the theoretical concepts, that they respond competently to technical questions and that they understand the limitations and contributions. A solid defence demonstrates that the research was carried out by the person presenting it.

4. Issue an academic judgement based on integrity and authenticity. The panel must base its assessment on originality, methodological quality, reliability of the data, overall coherence, respect for ethical principles and unequivocally human authorship of the thesis.

INTERNATIONAL DOCTORAL SCHOOL · URJC

Best practices for generative AI in the doctoral thesis, by role

Each actor in the doctoral process holds specific responsibilities regarding the use of Artificial Intelligence. Coherence between the ethical framework and practical conduct reinforces the culture of academic integrity in the training ecosystem.

01

Doctoral candidates

Primary users of AI in the thesis

- Use AI only as initial support, never as a substitute for intellectual design
- Transparently declare which tools were used and at which stages
- Document what was requested from AI, what it returned, and what was accepted or discarded
- Verify every reference, citation or data point against reliable scientific databases
- Do not delegate writing, conclusions or methodological decisions
- Maintain your own academic voice and terminological rigour

02

Supervisors and tutors

Ongoing oversight of the process

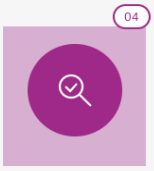
- Remind candidates that AI cannot be an author or co-author of the thesis
- Value critical thinking and prevent algorithmic dependency
- Review style to detect artificial or standardised segments
- Require an explicit declaration of AI use in the manuscript
- Ensure that methodology is designed by the candidate
- Request evidence of the human process: drafts, outlines, previous versions

03

Academic committees

Guarantors of institutional integrity

- Review the declaration of use when authorising thesis submission
- Confirm that AI-generated content does not replace intellectual contribution
- Drive clear and updated rules and recommendations
- Verify ethical compliance, transparency and academic integrity
- Promote an ethical, responsible and critical culture in the programme



04

External reviewers

Verification of originality and quality

- Verify human authorship across all substantive content
- Assess the quality and reliability of references and citations
- Review internal coherence and argumentative logic of the manuscript
- Detect signs of misuse: uniform style, artificial transitions
- Value the candidate's intellectual evolution and own work

05

Thesis defence panel

Final judgement on authorship

- Ensure the thesis reflects critical thinking and human authorship
- Assess the candidate's ability to defend their work orally
- Confirm that a transparent declaration of AI use exists
- Deliver a judgement grounded in originality, integrity and authenticity

Infographic produced with the support of the generative AI tool Claude (Anthropic)

III

RULES THAT MAY BE COMPROMISED BY THE INCORRECT USE OF AI

1. Introduction

In order to guarantee an ethical, safe and legally sound development of research activity in the area at hand, it is essential to identify the set of rules (internal, national, European and international) that may be compromised by an inappropriate use of AI tools.

It is worth recalling that the use of this technology must always be framed within respect for the obligations set out by the University, by State regulations on academic integrity, data protection and intellectual and industrial property, as well as by European regulatory frameworks and the international principles of scientific integrity.

This section presents those provisions whose breach may arise from an incorrect use of AI in the preparation of doctoral theses, with the aim of offering clarity and legal certainty to all the agents involved in the training and research process.

2. Regulations of Universidad Rey Juan Carlos

- Regulations on Evaluation in Doctoral Studies (Approved by the Governing Council of 31 January 2025). They regulate the process of verification and assessment of the doctoral candidate's work. Presenting AI-generated content as one's own production may be considered falsification or intellectual impersonation (breach by falsity of authorship). Furthermore, if AI introduces fabricated data ("hallucinations") or false references, the evidence standards required in the evaluation are breached (breach of quality criteria).

- Regulations governing doctoral studies (Approved by the Governing Council of 19 July 2024). These regulations govern the doctoral thesis, its content, its originality and the doctoral candidate's responsibility. Misuse of AI could breach some of the provisions of these regulations (e.g., art. 14. *Thesis commitment*; art. 17. *Monitoring the doctoral candidate's work*; art. 20. *Responsibility of thesis supervisors and tutors*; art. 21. *Content of the doctoral thesis*; and arts. 23 to 26, relating to the deposit, defence and evaluation of the thesis).

- URJC Coexistence Regulations Implementing Law 3/2022, of 24 February, on University Coexistence, approved by Resolution of 30 March 2023 of the Governing Council of the University**.** Although this regulation is oriented to general behaviour, it also covers serious academic offences related to integrity. If AI generates uncited content or it is passed off as one's own work, this regulation, which governs sanctionable behaviour (impersonation, fraud or academic plagiarism), is infringed.

- In addition to internal regulations, the EID has other documents that emphasise the need for a correct use of AI ("soft law" codes and recommendations with strong academic authority):

- *Recommendations on the use of AI for teaching staff*. It states that protected information must not be shared. This affects doctoral candidates who work with: interviews, personal data, medical records, business data, academic records, etc.

- *Manual for the Deposit of Theses (7/10/2025).* It requires the thesis to be the work of the doctoral candidate, the supervisor to validate the scientific quality and the contents to be verifiable. If AI introduces false information, or if the doctoral candidate conceals its use, the prerequisites for the deposit are breached.

3. National regulations

- Regulation RD 99/2011, of 28 January, regulating official doctoral studies and its amendment by RD 576/2023, of 4 July. Both regulations require an original work, supervision, evaluation and defence with guarantees of quality and integrity. Presenting as one's own substantive content generated by AI, falsifying progress, "inventing" references or methodologies or impeding verifiability may breach the provisions on supervision, monitoring, content and evaluation of the thesis.

- Law 3/2022, of 24 February, on University Coexistence. It defines and enables the response to academic fraud, impersonation, plagiarism or conduct that undermines the integrity of the training-evaluation process. The covert use of AI to produce work not authored by the doctoral candidate fits within this sanctionable framework.

- Law 1/2019, on Trade Secrets. When a doctoral candidate enters into an AI technical plans, formulas, algorithms or know-how supplied by a company, they may be communicating secret information to third parties without consent. And if information were uploaded to tools without guarantees, this would constitute an "*unlawful acquisition, use or disclosure*" and would, consequently, breach the custody and safeguarding required by the law.

- LO 3/2018, of 5 December, on the Protection of Personal Data and guarantee of digital rights (LOPDGDD). Uploading personal or sensitive research data (interviews, clinical, etc.) to AI systems without a legal basis, without informing or without security guarantees may breach the principles of lawfulness, minimisation, confidentiality and proactive responsibility.

- Law 24/2015, of 24 July, on Patents. If the doctoral candidate enters into an AI system technical details of an invention that is not yet protected, an uncontrolled disclosure may occur that destroys the novelty required to grant a patent. If there is a University-Company contract or an industrial joint supervision agreement, disclosing technical data to an external AI may constitute an unlawful exploitation or disclosure of protectable results. And if the AI generates diagrams, algorithms or devices based on patented technologies, the content of the thesis may incur an infringement of patent rights.

- Law RD 1/1996, of 12 April, approving the Consolidated Text of the Intellectual Property Law (TRLPI). It protects authorship, originality and prohibits unauthorised reproduction or transformation. Including text, graphics, codes or images generated by AI that copy or derive from protected works without permission, or that are integrated without citation, may infringe copyright and, within these, moral rights (paternity, integrity of the work).

4. European regulations

- Regulation (EU) 2024/1689 of the European Parliament and of the Council, of 13 June 2024, laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Regulation, “AI Act”). The AIR contains obligations addressed to providers, deployers, importers and distributors and authorised representatives. It does not contain specific provisions for Public Administrations or public-sector entities, such as a Public University, but to the extent that they are responsible for the deployment of AI systems, they will be subject to the obligations established therein. The AIR does not apply to the obligations of deployers who are natural persons using AI systems in the exercise of a purely personal, non-professional activity.

In the context of a thesis, what is most exposed is usually the use of generative models to write or “fabricate” results or the processing of personal data with non-compliant tools. The AI Act imposes duties especially on providers; however, users (including Universities) also assume duties of use in certain cases (e.g., transparency in systems that interact with persons).

- Regulation 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation, GDPR). If the thesis handles personal data and they are processed with AI (especially in clouds or external providers), compliance is required with the principles of lawfulness, transparency, minimisation, security, DPIA (Data Protection Impact Assessment) where applicable, and of non-transfer outside the EEA (European Economic Area) without guarantees. The misuse of AI may generate security breaches, unlawful transfers or processing without legal basis.

- Council Regulation (EC) No 6/2002, of 12 December 2001, on Community designs. If AI generates a design substantially similar to one already registered, its inclusion in the thesis may constitute an infringement of a registered design. And if the doctoral candidate publicly discloses their own design before its registration, the “design novelty”, an essential requirement for its registration, may be destroyed.

- European Patent Convention (EPC 1973, revised in 2000). This Convention requires absolute novelty, just like the Patents Law. Uploading content to an AI without control may destroy that requirement. Furthermore, if the thesis reproduces claims or schemes of European patents without authorisation, this would amount to infringement of a European patent if disclosed publicly.

5. International regulations ("Soft Law"; Codes and Recommendations with strong academic authority)

- European Code of Conduct for Research Integrity (ALLEA, 2023). Reference framework of the European Commission for EU-funded Projects. It defines honesty, rigour, transparency, responsible authorship, reproducibility and violations (falsification, fabrication, plagiarism, questionable practices). Uses of AI that conceal human contribution, fabricate data or falsify citations constitute integrity violations according to this Code.

- COPE (Committee on Publication Ethics, 2023). AI cannot be an author, its use must be declared in detail and responsibility is always human. Concealing the use of AI or delegating key intellectual decisions may contravene publication ethics and entail rejections or retractions.

- UNESCO — Recommendation on the Ethics of AI (2021). Non-binding global standard that promotes human oversight, transparency, non-discrimination, data governance and responsibility in education and research.

- TRIPS Agreement (WTO). The disclosure of undisclosed information (trade secrets) in AI systems generates a violation of the international protection of the technical secret; in addition, it may destroy novelty or the industrial character through mass disclosure prior to deposit.

IV

SUMMARY TABLES

The following tables provide a systematised overview of the main categories of AI systems and tools relevant to the academic field and, in particular, to doctoral research. Their objective is to facilitate the operational identification of uses, functions and risks associated with AI, rather than to establish a closed or taxonomic classification of its various forms.

In this sense, the categories presented should be understood as functional reference frameworks, constructed on the basis of practical criteria —type of interaction, purpose,

degree of autonomy or context of use— that are useful for guiding the responsible use of these technologies.

Given the dynamic nature of the AI ecosystem, these categories are not intended to be exhaustive or mutually exclusive, but may overlap or evolve with the development of new tools and services.

Consequently, their interpretation must always be carried out from an instrumental, critical and contextualised perspective, in coherence with the ethical, legal and methodological principles set out in this Guide.

1. Categories of AI systems in the academic environment

Category	What it is	What it can do	Commercial examples	Admissible use in doctorate	Declaration required	Main risks
Conversational generative AI	Assistant that responds in natural language	Write, summarise, translate, explain, suggest code, reorganise content	ChatGPT, Claude, Gemini, Meta AI, Grok	Yes, as instrumental support	Yes, when it substantively influences text, analysis or code	Hallucinations, false citations, biases, excessive simplification
Productivity copilot	Assistant integrated into suites and work environments	Write documents, summarise files, prepare presentations, organise notes and tasks	Microsoft Copilot, Gemini integrated in Workspace	Yes, for organisational and productivity tasks	Yes, if it generates content that passes into the doctoral work without sufficient reworking	Opacity about authorship, uncritical incorporation of content, processing of sensitive documents
Generative search / answer engine	Tool aimed at locating information and synthesising it with web or documentary support	Search, answer with sources, guide a preliminary exploration	Perplexity, search functions in Gemini, ChatGPT with browsing, Copilot with search	Yes, for initial bibliographic exploration	Yes, if it conditions the selection, the corpus or methodological decisions	Lack of exhaustiveness , ranking bias, erroneous citations, dependence on poorly interpreted sources
Research assistant on supplied sources	System that works on documents, PDFs, notes or corpora uploaded by the user	Summarise, connect sources, extract topics, generate questions or preliminary views of the material	NotebookLM and analogous source-analysis tools	Yes, with subsequent critical review	Yes, when the synthesis or patterns extracted pass into the analysis of the thesis	Partial readings, undue inferences, excessive reliance on automatic summaries
Programming copilot	Assistant aimed at development and technical automation	Generate, complete, debug or rewrite code; suggest scripts	Claude Code, Gemini Code Assist, GitHub Copilot, ChatGPT or	Yes, under strong supervision	Yes, when the code affects the obtaining, cleaning, analysis or	Undetected errors, opaque code, reproducibility problems

Category	What it is	What it can do	Commercial examples	Admissible use in doctorate	Declaration required	Main risks
			Claude used as coding support		visualisation of data	
Agentic AI	System that plans and executes subtasks using tools	Chain steps, use utilities, transform files, automate workflows	ChatGPT agent, agents created in Copilot Studio, other platform agents	Yes, but with reinforced supervision	Yes, whenever it intervenes in analytical processes, complex searches or production of results	Opacity of the process, chained errors, loss of methodological control
Agentic browser / computer-use agent	Agent that interacts with a browser or desktop as if it were a user	Click, browse, type, download, upload files, complete forms	OpenAI Operator, ChatGPT agent with computer use, Claude computer use	Very restricted, and only when compatible with institutional ethics, legality and security	Yes, expressly and in detail	Unintended actions, access to sensitive data, improper scraping, low traceability
Frameworks or tooling for agents	Infrastructure to build or deploy agents connected to web and tools	Automate interaction with pages, integrate models, orchestrate actions	Browser Use and similar tools for agentic automation	Only in theses with a clear technical component or intensive methodological supervision	Yes, as part of the method	High technical dependence, changes in external services, weak reproducibility

2. AI in scientific environments

The use of AI integrated into scientific and academic platforms must be understood as support for searching, navigating, synthesising and organising bibliography/references, but not as a guarantee of exhaustiveness, relevance or critical validity. Doctoral students will remain responsible for verifying sources, justifying the bibliographic selection, reading the fundamental works, understanding the scope and limitations of the tools employed and sustaining with their own criteria the interpretation of the state of the question and of the evidence used. Platforms may speed up access to relevant information, but they do not replace expert bibliographic review or academic judgement.

Technical note. Not all platforms describe their AI architecture publicly in the same way. In the documentation consulted, Elsevier does identify Scopus AI with a *RAG Fusion* approach; by contrast, other platforms speak of generative AI, natural-language search or “AI-powered summarization” without always detailing the same technical layer. For this reason, in this Guide it is advisable to prioritise the functional description of the system – what it does and how it affects the doctoral work– over technical classifications that are not always transparent.

Platform / service	Provider	Environment	What the AI does	Documentary base on which it operates	Visible type of approach	Typical utility in research	Note for the guide
Scopus AI	Elsevier	Bibliographic and citation database	Answers questions, summarises, shows emerging topics and makes the search steps transparent	Curated Scopus content	RAG declared; Elsevier mentions “patent-pending RAG Fusion”	Thematic exploration, initial state of the question, identification of emerging lines	Useful for discovery; does not replace expert bibliographic review
Web of Science Research Assistant	Clarivate	Bibliographic and citation database	Natural-language search, summaries, visualisations, guided tours	Web of Science Core Collection	GenAI with retrieval, exact architecture not publicly detailed in the source consulted	Discovery, initial orientation, support for navigating the bibliography	Requires human verification of exhaustiveness and relevance
ScienceDirect AI	Elsevier	Full-text scientific bibliography platform	Extracts, summarises, compares and explores evidence within peer-reviewed articles and chapters	Full text of ScienceDirect	Retrieval + generative synthesis over peer-reviewed bibliography	Comparison of findings, quick location of evidence, accelerated reading	Very useful for assisted reading; does not replace full reading of key sources
Dimensions (AI summarisation and AI functions)	Digital Science	Linked research database	AI-powered summaries and support functions on publications, grants, patents and trials	Linked graph of research data in Dimensions	AI-powered summarisation; RAG is not made explicit in the source consulted	Cross-cutting overview, monitoring of scientific output and connections	Good for a broad view; it is advisable always to check the source record
Semantic Scholar	Ai2	Scientific search engine	Semantic discovery and AI tools to find relevant bibliography	Scientific bibliography indexed by Semantic Scholar	Semantic search and AI tools	Locating works, thematic monitoring, assisted reading	Suitable for exploration; does not guarantee total coverage of a field
Elicit	Ought / Elicit	Bibliography review assistant	Helps to review bibliography, perform screening and extract data in systematic reviews	Scientific bibliography and documentary flows of the system itself	AI assistant for systematic review	Screening, data extraction, support for reviews	Very powerful, but its use must be documented in the review methods
Scite Assistant	Scite	Citation evaluation platform	Provides answers supported by bibliography and adds context from	Base of articles and Smart Citations from Scite	AI assistant with verified citations	Checking how a work is cited, support for evidence review	Useful for nuancing the authority of a citation; does not replace reading the paper

Platform / service	Provider	Environment	What the AI does	Documentary base on which it operates	Visible type of approach	Typical utility in research	Note for the guide
			verified citations				
Consensus	Consensus	Academic AI search engine	Searches and synthesises peer-reviewed bibliography	Peer-reviewed scientific bibliography	AI academic search	Quick questions based on papers, thematic orientation	Suitable for exploratory questions; does not replace systematic search
ResearchRabbit	ResearchRabbit	Bibliography discovery and visualisation	Uses AI to connect papers, authors and trends	Networks of articles and authors	Assisted discovery and visualisation	Mapping a field, following relationships and evolution	Very useful for network exploration; less so for critical synthesis
Connected Papers	Connected Papers	Visual discovery	Generates graphs of related articles	Networks of similarity/citation between papers	Algorithmic visualisation and discovery	Finding related works from a seed paper	Good for expanding the corpus; not equivalent to exhaustive search
Paperpal	Cactus / Editage	Academic writing	Assistance with drafting, editing and preparing manuscripts	Text supplied by the user and writing environment	Academic writing assistant	Linguistic review, drafts, formal improvement	Useful as writing support; must not replace authorship or critical apparatus

3. Types of academic-commercial service

Environment / type of service	Commercial examples	Main function	Level of autonomy	Main risk	Admissible use in doctorate	Recommended declaration
Bibliographic databases with AI assistant	Scopus AI; Web of Science Research Assistant	Reformulate queries, retrieve bibliography, offer summaries, thematic maps or visualisations	Medium	False exhaustiveness, ranking bias, oversimplification of the state of the art	Yes, for exploration, thematic orientation and initial support to the bibliographic review	Yes, where it has had a relevant influence on the selection of the corpus, the delimitation of the topic or the review strategy
Full-text scientific bibliography platforms with AI	ScienceDirect AI	Extract, summarise, compare and explore evidence within peer-reviewed	Medium-high	Partial reading induced by the system, loss of nuance, excessive trust in summaries	Yes, as support for reading and comparing bibliography	Yes, where the synthesis generated has substantively oriented the interpretation or selection of evidence

Environment / type of service	Commercial examples	Main function	Level of autonomy	Main risk	Admissible use in doctorate	Recommended declaration
		articles and chapters				
Scientific discovery platforms with AI summary or synthesis	Dimensions	Speed up discovery and offer summaries on publications, grants, patents or trials	Medium	Overly simplified panoramic view, dependence on automatic synthesis	Yes, to obtain an overview of the field	Recommended where used to support bibliographic or analytical decisions
Semantic or AI-assisted scientific search engines	Semantic Scholar, Consensus	Locate relevant bibliography and synthesise answers or thematic relationships	Medium	Uneven coverage, opacity in prioritisation, overly conclusive answers	Yes, for exploratory search	Recommended if they clearly condition the construction of the state of the question
Tools for AI-assisted bibliography review and screening	Elicit, Scite Assistant	Support bibliographic review, screening, data extraction and citation contextualisation	Medium-high	Uncritical delegation of methodological tasks, errors in extraction or interpretation	Yes, with strong methodological supervision	Yes, especially in systematic reviews, mappings or works where it affects the method
Bibliographic relational visualisation and exploration tools	ResearchRabbit, Connected Papers	Show connections between papers, authors and lines of work	Low-medium	Bias from dependence on a seed paper or on an incomplete network	Yes, for exploration and expansion of the corpus	Not always necessary, but recommended if it has been key in the construction of the corpus
Specialised academic writing assistants	Paperpal and analogous tools	Improve drafting, clarity, style and formal preparation of manuscripts	Low-medium	Excessive normalisation of style, loss of one's own voice, dependence in writing	Yes, as formal and linguistic support	Yes, where its intervention goes beyond idiomatic correction and affects the substantive content

4. Main commercial AI tools (I)

Tool	Company / provider	What it is	Typical main use in doctorate	Predominant type
ChatGPT	OpenAI	General-purpose conversational assistant for writing, reasoning, summarising, programming and working with different	Assisted writing, outlines, text review, programming support, initial synthesis	Generalist conversational

Tool	Company / provider	What it is	Typical main use in doctorate	Predominant type
		types of content. (OpenAI)		
Claude	Anthropic	Assistant oriented to writing, analysis, reasoning and work with documents and data. (anthropic.com)	Analysis of long texts, drafts, argumentative review, code support	Generalist conversational
Gemini	Google	Google's generative assistant for writing, planning, summarising and supporting general tasks. (Gemini)	Assisted search, drafting, brainstorming, general support for academic work	Generalist conversational
Microsoft Copilot	Microsoft	AI assistant integrated in the Microsoft ecosystem, focused on productivity, writing and work with files and applications. (Microsoft Copilot: Your AI companion)	Writing, presentations, documents, support for workflows with Microsoft 365	Productivity copilot
Perplexity	Perplexity	AI-powered answer engine focused on web search and answers with linked sources. (Perplexity AI)	Preliminary bibliographic exploration, quick location of information and sources	Generative search / answer engine
NotebookLM	Google	Research tool based on sources supplied by the user, designed to analyse materials and extract ideas. (Google)	Work with PDFs, websites, notes and closed corpora; synthesis and organisation of materials	Research assistant on supplied sources
Meta AI	Meta	General-purpose generative assistant integrated in the Meta ecosystem, with consultation and generation functions. (Meta AI)	Quick queries, light support for writing and ideation	Generalist conversational
Grok	xAI	xAI conversational assistant oriented to writing, code and consultation with real-time search capabilities. (xAI)	Writing, quick consultation, ideation, technical support	Generalist conversational
Gemini Code Assist	Google	Specific assistant for development and programming within the Gemini ecosystem. (Google for Developers)	Code generation and review, debugging, help with scripts	Programming copilot
Claude Code	Anthropic	Agentic programming-assistance tool capable of working on code bases and executing development tasks. (Claude API Docs)	Programming, file editing, technical automation	Programming copilot

5. Main commercial AI tools (II)

The “generative AI” category is not limited to well-known Western providers. There are today platforms and models developed in Asia that offer comparable functions – conversational assistants, code copilots, agents, multimodality or task automation– and that may be used by researchers in academic contexts. The geographical origin of the system may significantly affect aspects such as the working language, data governance, technological sovereignty, the conditions of use and the applicable regulatory framework.

System / platform	Origin	What it is, at a glance	Type	Example of interest for the guide
DeepSeek	China	General assistant/model with web, app and API; its documentation highlights tool use and API compatibility	Conversational generative AI / oriented to agents	Example of a Chinese alternative to Western generalist assistants; relevant for writing, code and assisted search (deepseek.com)
Manus	Founded in China; later relocated to Singapore and acquired by Meta in 2025	“Action engine” focused on executing tasks, automating workflows and producing deliverables; access to browser and file system	Agentic AI / agentic browser	Very useful for explaining that we are no longer talking only about chat, but about systems that do multi-stage work on web and files (manus.im)
Qwen	China (Alibaba Cloud)	Family of LLMs and MLLMs; the official website highlights open models, app and a line of native multimodal agents	Generalist generative AI / multimodal / agents	Good example of a broad ecosystem: chat, open models, multimodality and developer tools (qwen.ai)
ERNIE / ERNIE Bot	China (Baidu)	Conversational assistant and multimodal platform; Baidu presents ERNIE 5.0 as a unified multimodal model	Conversational / multimodal generative AI	Useful for showing that the Chinese ecosystem also includes platforms strong in multimodality and business services (ernie.baidu.com)
01.AI / Yi	China	Company of foundational models and applications; offers Yi and Yi-Coder models	Generalist generative AI / code	Good example of a Chinese offering also oriented to developers and commercial licences (零一万物-AI2.0大模型技术和应用的全球公司（01.AI）)
HyperCLOVA X	South Korea (NAVER)	Generative AI that NAVER describes as particularly strong in Korean language and context	Generalist / multimodal generative AI	Very useful for introducing the linguistic and cultural question: models trained for specific non-Anglophone contexts (clova.ai)
Sarvam / Indus	India	“Sovereign AI” platform focused on Indian languages; develops	Generalist / sovereign / multilingual generative AI	Of interest for university guides because of the

System / platform	Origin	What it is, at a glance	Type	Example of interest for the guide
		models, agents and applications		emphasis on sovereignty, local control and linguistic diversity (sarvam.ai)
Sakana AI	Japan	R&D laboratory focused on systems and agents; the company highlights solutions for Japan's needs	R&D in AI / agents	Less of a "copilot" for general commercial use, but very pertinent as an example of the Japanese ecosystem and of an orientation to agents (sakana.ai)

6. Use of AI in code generation and modification

AI tools may be used as support in tasks of programming, debugging, documentation, translation between languages or production of scripts. However, when the code generated, completed or modified by AI intervenes in the obtaining, cleaning, processing, analysis, visualisation or interpretation of research data, it must be considered part of the method and subjected to reinforced demands of understanding, validation and documentation.

The doctoral candidate must understand the operation of the code used, critically review its correctness, verify its results and assume full responsibility for its effects on the research process. The use of AI cannot justify the incorporation of scripts or programmes whose logic is not understood, whose execution cannot be explained or whose results have not been duly verified.

When AI has intervened relevantly in the generation, modification or execution of the code used in the thesis, this circumstance must be declared transparently, especially if it affects analytical procedures, automations, data processing or production of results.

Type of use	What it involves	Main risk	Recommended caution
Ad-hoc programming help	Suggestions of syntax, functions, structures or debugging	Undetected errors, false sense of correctness	Manual review and testing of the code
Generation of scripts for research	Code for cleaning, scraping, analysis, visualisation or processing	Methodological opacity, erroneous results, reproducibility problems	Full understanding, validation and documentation
Refactoring or automatic translation of code	Rewriting between languages, optimisation or reorganisation	Introduction of invisible changes or subtle errors	Comparison between versions and control tests
Agentic execution or automation of code	Systems that generate, launch and chain scripts or tasks	Loss of control, low auditability, cumulative errors	Reinforced supervision and integral traceability

Code generated or modified by AI must not be treated as a mere technical aid when it influences the method, data or results of the thesis, but as a methodological component that requires full understanding, validation and responsibility.

7. Use of AI in image, sound and translation generation

In these fields, AI not only intervenes in the production of verbal content, but also in the creation of visual, sound and multilingual materials. For this reason, the obligations of transparency, supervision and attribution must equally extend to images, sound, voices, translations and other products generated or transformed by AI.

The use of AI tools to generate or transform images, videos, voices, translated documents or localised content may be admissible as instrumental support in doctoral activity, provided that there is effective human supervision, that no misleading impression is given about the synthetic or transformed nature of the material and that the rights, consent, confidentiality and academic integrity applicable in each case are respected. In visual, sound and audiovisual materials, the demand for transparency is especially important, given that the technical verisimilitude of the result may conceal its AI-generated or AI-altered nature.

Field	What it does	Commercial examples	Typical academic or scientific use	Main risk	Admissible use / observation
Image	Generates, edits, expands or transforms images on the basis of instructions	Adobe Firefly, ChatGPT Images, Canva Magic Media, Qwen Image	Teaching materials, posters, visual schemes, dissemination, prototypes	Misleading appearance of evidence, copyright issues, opacity about origin and editing	Admissible as support for communication and teaching; must not be presented as documentary evidence without a clear declaration. (Adobe)
Video	Generates or transforms video from text, image or clips	Sora, Runway, Pika, Kling AI, Hailuo, Canva AI Video	Teaching videos, dissemination, visualisation of processes, presentations, audiovisual prototypes	Deepfakes, misleading realism, reuse of identities, false documentary status	Admissible for support and dissemination materials; requires special transparency about its synthetic character.
Audio and voice	Synthesises voice, dubs, narrates, transforms audio or generates sound effects	ElevenLabs, Adobe Firefly Audio, HeyGen, Stable Audio	Accessibility, narration of materials, voice-over, teaching resources, localisation	Identity impersonation, lack of consent, dubious authenticity	Admissible with reinforced caution; especially sensitive when identifiable voices are involved. (Stability AI)
Music and composition	Generates songs, instrumental tracks, music beds or full compositions from instructions	Suno, Udio, Stable Audio, MiniMax Music	Podcasts, teaching videos, presentations, dissemination resources, background music for materials	Doubts about authorship, exploitation rights, aesthetic homogenisation, confusion between own work and generated work	Admissible for creative support and production of materials; its use should be declared when the music forms a substantive part of the academic or outreach product. (Suno)

Field	What it does	Commercial examples	Typical academic or scientific use	Main risk	Admissible use / observation
Sound effects and soundscapes	Generates isolated sounds, ambiences, Foley and sound layers to accompany audiovisual pieces	Adobe Firefly Sound Effects, Stable Audio Open, related tools from multimodal suites	Didactic videos, prototypes, simulations, presentations, resources for accessibility	Confusion about the authenticity of the audio, opaque reuse, uncritical use in supposedly documentary materials	Admissible as technical support; its misleading use in materials that purport to be real recordings must be avoided. (Adobe)
Textual translation	Translates text, documents and reformulates style or tone	DeepL Translator, DeepL Write, Canva Translate, Qwen Translate	Instrumental translation of bibliography, multilingual drafts, academic communication	Terminological errors, loss of nuance, false sense of accuracy	Admissible as support; does not replace expert review or responsibility for the final meaning.
Audiovisual translation and localisation	Translates video or audio, dubs, subtitles and synchronises	Adobe Firefly Translate Video/Audio, HeyGen Video Translate	International teaching, MOOCs, scientific dissemination, subtitling and localisation	Voice alteration, misleading naturalisation, semantic errors	Admissible with a clear declaration when it modifies the original language, voice or presentation of the material. (Adobe)
Suites integrated with AI	Bring together several functions of image, video, audio, music or translation in a single platform	Canva Magic Studio, Adobe Firefly, CapCut, Qwen multimodal	Quick production of academic materials, presentations, social networks, institutional communication	Uncritical use, mixing of one's own and synthetic material, conditions of use that are seldom read	Very relevant for the university environment because they lower the entry barrier and normalise the use of AI. (Adobe)

8. Use of AI in Health Sciences

In Health Sciences, AI appears today in very different environments: clinical documentation, image analysis, digital pathology, search and exploitation of health data, and the development of specialised biomedical models. In the context of a doctoral guide, these tools must not be understood primarily as ready-made solutions for clinical adoption, but as examples of the types of systems that may intervene in research projects, theses with a methodological component or studies on implementation, evaluation, governance and impact of AI in health. The following list is indicative and non-exhaustive.

In the field of health sciences, the use of AI demands reinforced caution due to the special sensitivity of the data, the potential clinical relevance of the results and the need for rigorous methodological validation. These tools may be used as an object of study, as a component of the method or as support for certain research tasks, but they must not be assumed as a guarantee of clinical reliability, scientific validity or care applicability without the corresponding evaluation, documentation and expert supervision.

Field	What it does	Commercial examples / platforms	Typical doctoral or research use	Main risk	Admissible use / observation
Clinical documentation and care workflows	Ambient listening, dictates, summarises, structures notes and helps with clinical documentation tasks	Microsoft Dragon Copilot	Research on clinical documentation, workflow analysis, implementation studies, theses on clinical-AI interaction	Confidentiality, uncritical automation of the record, dependence on the system	Relevant for research in digital health and healthcare organisation; must not be confused with scientific validation of the clinical content. (Microsoft)
Clinical AI integrated in radiology and care pathways	Prioritises cases, supports detection, coordinates alerts and connects teams and care workflows	Aidoc	Theses on the implementation of clinical AI, impact evaluation, workflow studies, governance and hospital adoption	Overconfidence, deployment bias, opacity of the system, uneven integration	Useful as a case study of real clinical AI; demands very careful methodological and regulatory analysis. (Healthcare AI | Aidoc Always-on AI)
Digital pathology and histological analysis	Analyses pathology images, supports biomarkers, translational research and diagnostic workflows	PathAI	Theses on computational pathology, biomarkers, validation of models, diagnostic implementation	Dataset bias, limited generalisation, dependence on proprietary platforms	Very pertinent for doctorates when AI forms part of the method or of the object of study; requires robust validation. (pathai.com)
Biomedical models for developers and research	Models for the understanding of medical text and image and for building healthcare applications	MedGemma (Google)	Theses with a technical component: prototypes, evaluation of medical models, adaptation and fine-tuning	Performance not validated in real context, undue extrapolations	Suitable for research or development projects; direct clinical utility must not be assumed without specific validation. (Google for Developers)
Retired or transitional healthcare models	Models for QA and summarisation of healthcare documents in a cloud environment	MedLM (Google, already retired)	Useful reference for contextualising the evolution of the sector, not as a current tool of the future	Obsolescence, technological dependence	It is advisable to cite it only as a precedent: Google indicates that MedLM has stopped/will stop being available from September 2025. (Google Cloud Documentation)
Search and exploitation of health data in cloud	Storage, access, search and connection of structured health data	Google Cloud Healthcare API and Vertex AI Search for healthcare data	Theses on interoperability, semantic search, data infrastructures, healthcare apps	Data governance, privacy, infrastructure biases, provider dependence	Relevant for doctorates in biomedical informatics, digital health and interoperability; more infrastructure than “copilot”. (Google Cloud Documentation)

9. Particularly sensitive areas in the doctorate

There are certain areas of doctoral research in which the use of AI demands reinforced caution, whether due to the sensitivity of the data processed, the vulnerability of the persons or groups involved, the methodological complexity of the analysis or the possible ethical, legal or social impact of the results. In these cases, AI must not be considered a neutral tool or one for ordinary use, but rather an element that may intensify risks already present in the research and that, therefore, requires greater demands of justification, supervision, traceability and validation.

In particularly sensitive areas, the use of AI must be subject to reinforced criteria of prudence, proportionality, human supervision and protection of rights. Its use must be expressly justified when it affects sensitive data, vulnerable persons or groups, complex interpretation processes or environments where it may produce relevant effects on representation, evaluation, classification or decision-making.

Field	Why it is particularly sensitive	Main risk in relation to AI	Recommendations
Health sciences	May involve clinical data, diagnoses, medical imaging, decisions with care relevance or results potentially applicable to clinical practice	Over-interpretation, false appearance of clinical validity, use of especially protected data, methodological opacity	Reinforced expert supervision, rigorous validation, strict data protection and clear delimitation between research support and clinical applicability
Personal data and especially protected data	Includes identifiable or sensitive information: health, biometrics, ideology, religion, sexual orientation, social or judicial situation, among others	Re-identification, leakage, unauthorised processing, undue upload to external platforms	Data minimisation, effective anonymisation, review of conditions of use and prohibition on entering sensitive or confidential data into unauthorised tools
Research with vulnerable populations	Affects minors, patients, victims, migrants, persons with disabilities, the elderly or excluded groups	Representation biases, simplification of testimonies, ethical harm through classification or automated interpretation	Reinforced justification, intensive human control, special attention to consent, representation and context
Psychology, education and applied social sciences	Often work with interviews, focus groups, open responses, personal trajectories or delicate institutional contexts	Reductive automatic coding, over-interpretation, loss of nuance, categorial bias	Prudent use of AI only as support, manual review of categorisations and reinforced methodological transparency
Legal, forensic and criminological sciences	Argumentation depends on conceptual precision, normative interpretation and rigorous handling of sources	Invented case-law or references, doctrinal simplification, displacement of one's own legal reasoning	Strict verification of sources, prohibition on relying on unverified outputs and preservation of autonomous legal judgement
Bioinformatics, genomics and omics data	These are fields of high technical complexity and strong biological sensitivity,	Pipeline opacity, non-auditable inferences, misinterpretation of results	Exhaustive process documentation, full methodological

Field	Why it is particularly sensitive	Main risk in relation to AI	Recommendations
	with risk of re-identification and overfitting		understanding and specialised validation
Biometrics, surveillance and behaviour analysis	May involve facial, voice or emotion recognition, tracking or profiling	Discrimination, intrusion, known biases, uses incompatible with ethical principles	Reinforced ethical evaluation, limitation of uses, strict justification and attention to the possible impact on rights
Translation and interpretation in sensitive contexts	May affect consents, testimonies, clinical or judicial materials, or minoritised languages	Loss of nuance, semantic shifts, false conceptual equivalence	Expert human review, special caution in critical documents and declaration of use when it affects the analysis
Heritage, archives and testimonies	May include restricted materials, sensitive collections, testimonies of violence or culturally delicate documents	Decontextualisation, inappropriate classification, disrespectful or unauthorised treatment	Attention to the archival and cultural context, human review and respect for access or use restrictions
Evaluation, accreditation and institutional analytics	Affects trajectories, performance, profiling and possible decisions about persons or groups	Biases, undue automation, procedural injustice, opacity in criteria	Very restricted use, total traceability and prohibition on delegating evaluative decisions to AI systems
Audiovisual production, identity and representation	May involve synthetic voice, generated video, avatars, recreations or image manipulation	Confusion between document and synthetic material, impersonation, loss of authenticity	Clear declaration of use, strict limits in evidentiary or testimonial contexts and caution with recognisable identities
Security, cybersecurity and dual-use fields	Some research may facilitate surveillance, technical exploitation or potentially harmful applications	Dual use, potential harm, automation of sensitive capabilities	Reinforced ethical and methodological review, strict delimitation of scope and special prudence in the dissemination of procedures

10. Automation and orchestration of tasks with AI

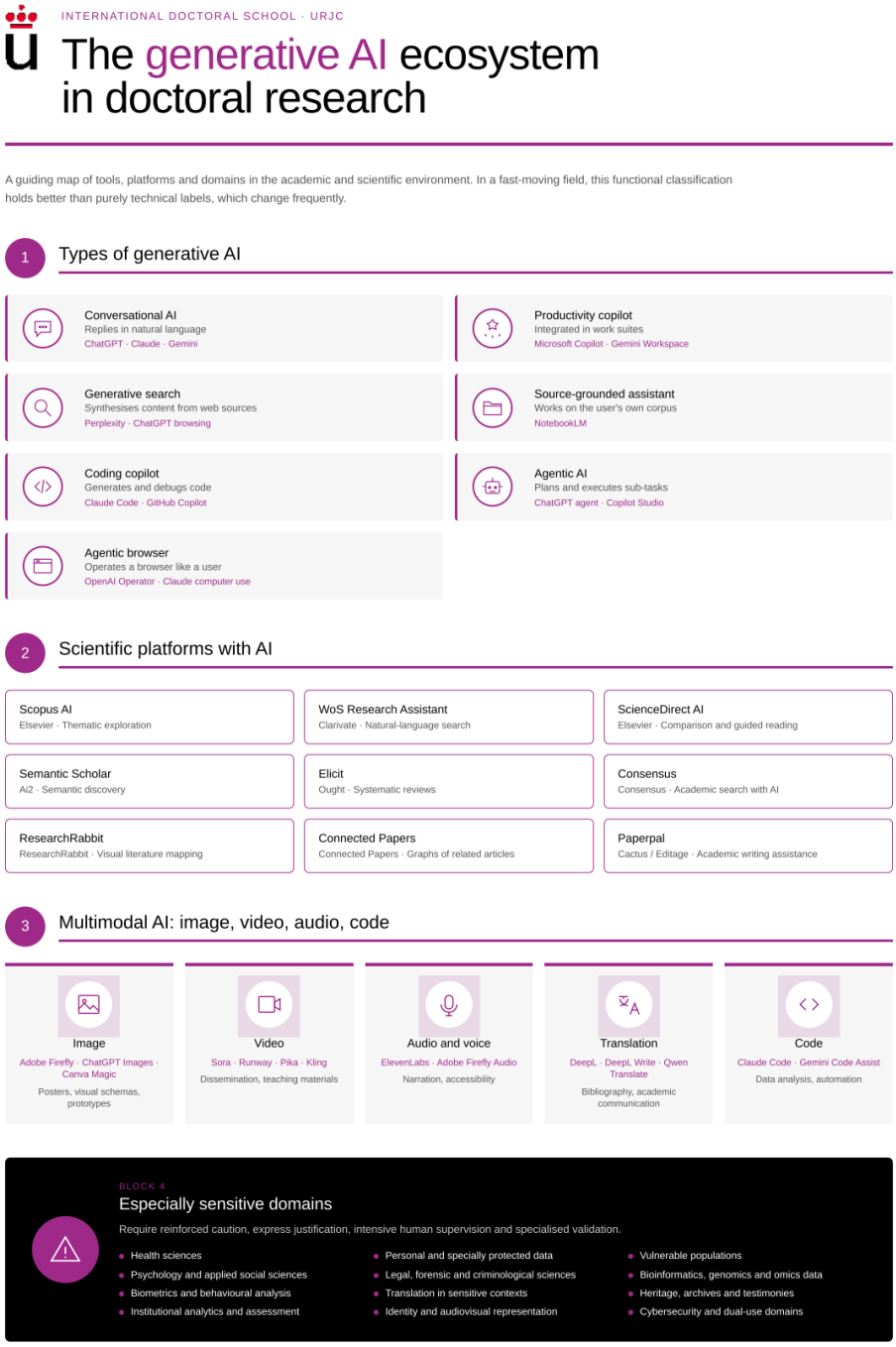
The use of AI in the doctorate is not limited to one-off interactions with generative tools, but may extend to the automation of tasks, processes or workflows by means of agents, scripts, integrations or chained systems. In these cases, the evaluation of the use of AI must not address only the final result obtained, but also the degree of autonomy of the system, the level of human supervision, the traceability of the process and the methodological impact of automation on the research.

Automation may prove useful in tasks such as the retrieval and organisation of bibliography, the transcription and classification of materials, the cleaning and transformation of data, the batch generation of summaries or translations, or the execution of repetitive analysis processes. However, it may also intensify risks already present in the use of AI, by multiplying errors, concealing methodological decisions within the workflow itself and making it difficult to understand, verify or reproduce the operations carried out.

For this reason, the greater the degree of automation, the greater must also be the requirement for effective human supervision, process documentation, validation of results

and critical control by the doctoral candidate. Automation cannot justify the uncritical delegation of intellectual or methodological decisions, nor exempt from responsibility for the quality, reliability, integrity and lawfulness of the work performed. In particular, caution must be heightened when automation affects personal or sensitive data, materials subject to access or use restrictions, complex analysis and interpretation processes, or agentic systems capable of navigating, downloading, transforming and reorganising information in a semi-autonomous or autonomous manner.

Type of automation	What it involves	Main risk	Recommendations
Automation of bibliographic searches and screening	Automatic retrieval, filtering and organisation of materials	False exhaustiveness, selection bias, dependence on opaque criteria	Human review of results and justification of criteria
Automation of transcription, classification or labelling	Batch processing of interviews, documents, images or records	Cumulative errors, loss of nuance, reductive categorisation	Manual validation and control sampling
Automation of data cleaning and transformation	Reordering, depuration, normalisation or automatic enrichment	Undetected alterations, methodological opacity, loss of traceability	Exhaustive documentation of the pipeline and verification of each stage
Agentic automation of complex tasks	Systems that chain actions on web, files or tools	Loss of control, low auditability, execution of unintended actions	Reinforced supervision, clear limits of use and integral review of the process



Infographic produced with the support of the generative AI tool Claude (Anthropic)

ANNEX I

DECLARATION OF USE OF GENERATIVE AI

I, **[name and surname]**, doctoral student at the International Doctoral School of Universidad Rey Juan Carlos, declare that I have used AI tools in a limited and complementary manner in the preparation of my doctoral thesis entitled **[add corresponding title]**.

The content generated has been reviewed, contrasted and, where appropriate, modified by me. I assume full responsibility for the final result and I confirm that the use of these tools has been carried out in compliance with the applicable academic rules, with an ethical commitment and following the EID Guide on the Use of Generative AI.

Tool(s) used:
Date of use:

Use made [tick as appropriate]:

☐ Text generation	☐ Image, audio or video generation
☐ Reformulation, review or rewriting	☐ Data processing
☐ Translation / correction	☐ Data analysis
☐ Information search	☐ Inspiration of creative ideas
☐ Bibliography search	☐ Methodological support
☐ Summaries, outlines	☐ Other. Indicate which:

Brief description of the use made:

In_____, on the __ of _____ of 2026

Signed:

ANNEX II

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