

Trabajos Fin de Máster ofertados por el IBMCP y empresas 2026

Listado detallado

DEPARTAMENTO DE BIOTECNOLOGÍA Y MEJORA VEGETAL DE ESPECIES CULTIVADAS

Proyecto: AI Agents for Genome Archaeology: Detecting Retrogenes as Molecular Fossils of Transposable Element Activity

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The Bioinformatics and Evolutionary Genomics lab (IBMCP, CSIC–UPV) applies comparative and evolutionary genomics to understand how genomes are shaped over time. We are offering a Master's Thesis position for a student interested in transposable element biology, comparative genomics, and the use of AI agents to automate genomic analyses, at the intersection of genome evolution and agentic bioinformatics.

Most gene duplicates keep their parent's intron–exon structure, but a subset, retrogenes, do not: they arise when a spliced mRNA is reverse-transcribed and reinserted elsewhere in the genome by the enzymatic machinery of LINE-type retrotransposons, leaving an intronless copy behind. Because a retrogene can only form while its host transposable element (TE) family is active, each retrogene is indirect evidence of when that TE family was transcriptionally and enzymatically live. This project addresses whether that record can be read systematically: it will test whether the age distribution of retrogenes tracks the age distribution of the TE families capable of producing them, across genomes with contrasting TE histories.

The student will build an AI agent, using Claude as the agentic backbone, that orchestrates the full analysis: annotating and age-dating transposable elements, detecting candidate retrogenes, estimating their age, and testing the TE–retrogene age relationship across a panel of public plant genomes. Along the way, the student will learn:

- Transposable element annotation and age-dating (LTR_Retrieve, EarlGrey)
- Comparative and evolutionary genomics across species
- Retrogene detection and molecular dating methods
- Building and directing AI agents with Claude for autonomous bioinformatics pipelines
- Reproducible, script-based bioinformatics analysis

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