

★ Learn More About the Speakers & Their Work

Seminar Series – Life Sciences Department & AI Factory

This section introduces all eleven speakers, their research focus, and what they will discuss during the seminar week.

1. Dr. Cleofé Peña-Gómez — AI for Suicide Prevention in Mental Health

About her work Dr. Peña-Gómez investigates **suicidal behavior** using large-scale clinical data. Her IDICIUS project develops an AI-powered early-warning system using anonymized electronic health records. Her study integrates data from four public sources and analyzes **41,557 adult mental-health patients**, testing multiple ML models. Ensemble methods such as Gradient Boosting and XGBoost performed best, identifying key risk factors including corticosteroid use, psychiatric medications, depression, and sex-specific effects.

What she will speak about

- AI-driven early detection of suicide risk
- Data integration, anonymization, and modeling
- Predictive factors and model performance
- Ethical and clinical considerations
- Clinical decision-support for mental health

2. Eduard Rodríguez — Neurosymbolic Multi-Agent Systems for Pediatric Pre-Triage

About his work Eduard Rodríguez develops **neurosymbolic AI** systems combining LLMs with deterministic clinical rules. His multi-agent architecture decomposes triage into specialized agents for symptom extraction, guideline matching, validation, safety checks, and explanation generation. A key innovation is **auditability**, enabling clinicians to inspect each reasoning step.

What he will speak about

- Multi-agent neurosymbolic architectures
- Transparent and auditable clinical AI
- Safe routing between emergency and primary care
- Modular design for trustworthy decision support

- Lessons from integrating LLMs with guidelines

3. Franco Simonetti — Energetic Frustration & Protein Function

About his work Franco Simonetti studies proteins as dynamic physical systems shaped by evolution. His work focuses on **energetic frustration** to understand how proteins balance stability, flexibility, and function. Frustration analysis reveals catalytic sites, conformational changes, interactions, and disease-related disruptions. He also explores how AI models implicitly learn biophysical constraints.

What he will speak about

- Energy landscapes & minimal frustration
- Functional insights from frustration analysis
- AI models for protein biophysics
- Applications in disease and protein design

4. Marc Grau — Circadian Gene Expression in the Developing Human Brain

About his work Marc Grau studies how **circadian rhythms** emerge during human brain development using >700,000 single-nucleus RNA-seq profiles. Using CYCLOPS and CHIRAL, he reconstructs internal circadian phase from transcriptional patterns, revealing **sex-specific differences** in circadian encoding.

What he will speak about

- Circadian rhythms in cortical development
- ML tools for reconstructing circadian phase
- Cell-type-specific rhythmic genes
- Age- and sex-dependent differences
- Implications for neurodevelopment

5. Mario Jojoa — Speech Analysis for Trustworthy & Human-Centered AI

About his work Mario Jojoa works on **speech representation learning** for trustworthy AI. His seminar covers two applied cases:

- **Synthetic voice detection** across English, Spanish, and Hungarian, comparing a complex-valued CNN with Wav2Vec 2.0
- **Spanish speech emotion recognition** using the EmoSpeech 2024 / Spanish MEA Corpus, comparing acoustic vs. linguistic embeddings (BETO, RoBERTuito) and fusion strategies

What he will speak about

- Fake-voice detection in multilingual settings
- Emotion recognition in natural Spanish speech
- Acoustic vs. linguistic embeddings
- Representation choices & evaluation protocols
- Designing robust speech-based AI systems

6. Miguel Rodríguez — NLP for Materials Science: The BiomatDB Project

About his work Miguel Rodríguez develops NLP methods for extracting structured knowledge from unstructured materials-science literature using **sentence transformers** and domain-specific LLMs. In the **BiomatDB EU project**, he applies text classification to:

- Multi-label MeSH term classification using SetFit (few-shot learning)
- PubMed abstract classification using fine-tuned biomedical LLMs

What he will speak about

- Challenges in biomaterials knowledge extraction
- Transformer-based NLP for scientific text
- Few-shot learning with SetFit
- Domain-specific LLMs for materials science
- Applications within BiomatDB

7. Miguel Vázquez — AI Agents as Research Assistants

About his work Miguel Vázquez explores how **AI agents** support scientific workflows when connected to real tools, data, and reproducible environments. His experience at BSC led to **Scout-AI**, an agentic layer on top of the Scout/Rbbt workflow framework.

What he will speak about

- Practical use of AI agents in research
- Tool integration, provenance & reproducibility
- Separating model reasoning from computation
- Examples from coding, bioinformatics & modeling
- How agentic AI supports knowledge-intensive work

8. Natàlia Pujol — Multimodal Analysis of Aging in Female Reproductive Organs

About her work Natàlia Pujol integrates deep learning on **1,112 histology images** with RNA-seq data from **659 samples** across seven reproductive organs (ages 20–70). Her findings reveal **asynchronous aging trajectories**:

- Ovary ages gradually
- Uterus undergoes an abrupt shift around menopause
- Plasma proteomics confirms organ-linked aging signatures

What she will speak about

- Organ-specific aging trajectories
- Deep learning + RNA-seq multimodal integration
- Menopause as an aging inflection point
- Tissue-resolved aging signatures
- Implications for women's health

9. Ruite Xiang — AI-Driven Hit Identification in Drug Discovery

About her work Drug development is long, costly, and failure-prone, especially in early stages like hit discovery. AI improves this by exploring chemical space efficiently and prioritizing compounds with better activity and ADMET profiles.

Her seminar focuses on AI methods for hit discovery:

- **Virtual screening** to identify potential binders
- **Generative models** for designing new molecules

What she will speak about

- AI for early-stage drug discovery
- Virtual screening approaches
- De novo molecular design
- Improving activity & ADMET prioritization
- Reducing failure rates in drug development

10. Simón Orozco — Deep Learning for Genomics: The Flying Gene Challenge

About his work Transposable elements (“flying genes”) shape genome evolution but are difficult to detect due to their repetitive nature. Simón Orozco presents transformer-based and foundation-model approaches enabling scalable, high-resolution annotation **without curated libraries**.

What he will speak about

- Transposable elements & genome evolution
- Transformer-based annotation methods
- Benchmarking across diverse taxa
- Identifying biases in current tools
- AI-driven insights into adaptation & disease

11. Uma Lal — Deep Learning for Stroke Imaging

About her work Acute ischemic stroke requires rapid diagnosis. Brain CTA provides rich information but is challenging for deep learning due to its complexity. Her seminar presents two innovations:

- Guiding networks toward vascular structures in full 3D CTA
- **Learnable 3D Pooling (L3P)** to encode 3D images into compact 2D feature maps

What she will speak about

- Clinical challenges in AIS
- Structure-guided deep learning for CTA
- L3P for efficient 3D-to-2D encoding
- Improving interpretability & efficiency
- Applications across medical imaging