

# Jad SAWAN

 jas50@mail.aub.edu

 [github.com/GraphiCortex](https://github.com/GraphiCortex)

 [Coursera Profile](#)

## EDUCATION

### American University of Beirut (AUB) — Beirut, Lebanon

B.Sc. Biology & Mathematics (pure track)

(Double Major)

*Expected: May 2027*

Minor: Computational Science

GPA 3.91/4.00 (Dean's Honor List; Merit Scholarship 30%)

## RESEARCH—BIOMEDICAL IMAGING & AI

### AI-Assisted PSMA PET/CT for Prostate Cancer Staging & Response

*Second author — manuscript in preparation*

AUBMC Urology Department × AUB AIM Program • 2025–Present

Architected a cross-scanner PET/CT harmonisation workflow producing lesion-level metrics reliable for staging/response modelling.

- Designed the pipeline end-to-end (de-ID, SUV harmonisation, PET–CT co-registration/resampling) and led mask schema/labeling with double adjudication; all steps tracked by config-hash provenance.
- Specified transportability evaluation (re-registration jitter, alternate labelers, cohort resampling) and model-readout tables (e.g.,  $SUV_{max}$ , lesion volume, capsule distance) for reproducible validation across devices/readers.
- Dataset: ~1200 patients, 5 scanners, 5,250 lesions.

### Endoscopic Video Analysis for Post-HoLEP Continence Prediction

*Primary contributor*

AUBMC Urology Department × AUB AIM Program • 2025–Present

Co-led a video-to-features pipeline for 1–3-month continence using operative footage and clinical covariates.

- Theorised and implemented a compact phase/landmark ontology; built timeline alignment and derived features (time-in-view, phase durations, motion energy, blur/illumination stability, visibility indices).
- Drafted the training/evaluation protocol (splits, leakage checks, adjudication workflow) and integrated feature stores with the clinical table for scalable modelling.
- Corpus: ~160 cases, 130 h video, 3 phases, 12 landmarks.

## RESEARCH—COMPUTATIONAL NEUROSCIENCE

### Innovations in 3D Neuron Morphology Reconstruction

*Primary contributor*

AUB Neuroscience Program, Daou Lab • 2024–Present

Proposed and implemented a hybrid neuron-reconstruction architecture robust to noise and morphological variance.

- Combined centreline graph-convolutional representations with skeleton descriptors (branch order, tortuosity, Sholl-style counts); specified loss targets for geometry/topology fidelity.
- Built a benchmarking suite (Gaussian noise, down-sampling, intensity dropouts, occlusion); exported SWC and evaluated node/edge error, branch continuity, and loop artefact rate.
- Corpus: 148 volumes; 4 perturbation types.

### Computational Analysis of E2F Signalling & Cell-Cycle Re-Entry in Mature Neurons

*Contributing researcher*

AUB Biology Department (Dr. Noel Ghanem) • 2025–Present

Assessed whether E2F activity marks stress and early apoptotic change in post-mitotic neurons.

- Linked E2F-family ChIP-seq peak sets to RNA-seq responses; ran differential expression with pathway enrichment to prioritise mechanisms over gene lists.
- Cross-verified effect directions across datasets to reduce batch artefacts; produced a short list of interpretable markers and a small Boolean/ODE hybrid to probe early-apoptosis sensitivity.
- Data: 5 datasets; 3675 peaks; 2028 genes.

## RESEARCH — THEORETICAL & INTERDISCIPLINARY

### From Networks to Categories: Semantics for Mind in Physical Networks

Primary contributor

AUB Department of Philosophy (Dr. Karam Wahab) • 2024–Present

Formulated a categorical semantics for physically realised networks in which capacities and agency are explicit: specifying objects/morphisms and level-linking structure (adjunction-style maps, limits/colimits, optics/lenses), and stating preservation/realisation conditions for principled comparison beyond graph-only or Markov assumptions.

### Socio-Philosophical Diagnostics of Postmodern Disembedding → Toward Metamodernity

Primary contributor

AUB Department of Sociology & Anthropology (Dr. Rima Rassi) • 2025–Present

Prepared an integrative essay that, through a Taylorian lens on the secular age, relates disembedding to institutional/personal fragmentation and argues that mythic structures continue to organise perception, desire, and conflict, culminating in an education-centred response oriented to virtue, imagination, and ethical agency.

## SKILLS

### Programming

Python; R; MATLAB; C/C++; Java; C#; SQL

### Technical Foundations

Linux; Git/Git LFS; GitHub; Conda; Docker; Jupyter; Make/SnakeMake; L<sup>A</sup>T<sub>E</sub>X; NumPy; SciPy; Pandas; Matplotlib; scikit-learn; PyTorch; OpenCV; SimpleITK; MONAI; pydicom; NiBabel; ffmpeg; 3D Slicer; ITK-SNAP

### Reproducibility & Ops

Config-hash provenance; versioned codebooks; inter-rater checklists; sensitivity suites (registration jitter, labeler variants, cohort resampling)

### Theoretical Foundations

Dynamical Systems & Chaos; Fourier Analysis & PDEs; Graph & Category Theory; Systems Biology & Computational Physiology; Cognitive Science & Human Behavioural Biology; Physics-informed / structure-aware ML

### Languages

English (C2); Arabic (native); French (C1)

## INDEPENDENT RESEARCH PROJECTS

- **Number Theory & Conditional Probability on  $n$ -Dimensional Dice** — Proofs and counter-examples showing how arithmetic structure shapes conditional event frequencies; drafting a short manuscript.
- **Group-Symmetry Methods for Differential Equations** — Worked examples linking symmetry to solution structure for ODEs/PDEs (invariants, reductions, conserved quantities).

## ACTIVITIES

### Seminars & Audits

Regular attendee: Daou Lab seminars and affiliated workshops; AUB Philosophy/Sociology colloquia (2024–Present).

Auditing: Special Topics in Philosophy of Mind (Daniel Dennett); Philosophy of Religion; Special Topics in Physics: Computational Physics (graduate level, ongoing).

### Journal Club

Member, Neuroscience Journal Club (Daou Lab).

## CERTIFICATIONS

- Deep Learning Specialization — DeepLearning.AI (2024)
- Machine Learning Specialization — DeepLearning.AI (2023)
- AI for Medicine — DeepLearning.AI (2022)
- Neuroscience & Neuroimaging — Johns Hopkins (2022)
- Advanced Neurobiology I — Peking University (2023)
- Advanced Neurobiology II — Peking University (2023)
- Computational Neuroscience — University of Washington (2022)
- Computational Thinking for Problem Solving — University of Pennsylvania (2023)