# Antonios Tragoudaras

🖀 https://antragoudaras.github.io/ | 🖸 antragoudaras | 🛅 Antonios-Tony-Tragoudaras

## Education \_\_\_\_

### University of Amsterdam (UvA)

MSc in Artificial Intelligence GPA: 8.29/10 (84/120 EC, 36 EC thesis in progress) - In track to graduate with cum-laude (highest distinction). Thesis Project: Physics-Based Dynamics: Quantifying and Instilling Physics-Cognition of Visual Foundation Models (VFMs). ELLIS MSc Honors Student.

### King Abdullah University of Science and Technology (KAUST)

Visiting Student & Research Assistant in Electrical and Computer Engineering

Interdisciplinary Research and published in top-tier Journals & Conferences.

Projects on Neural Arcitecture Searh, Efficient Deep Learning & TinyML, Voice Acitvity Detection, and Visual Perception for Autonomous Driving Applications.

### **University of Thessaly**

BEng in Electrical & Computer Engineering (5-years studies; 300ECTS)

Thesis Grade: 10/10 (Excellent), GPA: Upper Second-Class Honors.

Undergrad. Research Project: Design Space Exploration of MobileNetV2 and inference acceleration on FPGAs.

## **Research Experience**

	University of Amsterdam (UvA) /
Physics-Based Dynamics	Institute of Science & Technology
	(ISTA)
MSc thesis project @ UvA supervised by: Professor Efstratios Gavves.	Eah 2025 Deceant
Academic visitor @ IST Austria co-supervised by: Francesco Locatello.	red. 2023-Present

Description/Goals:

- · Leveraging insights from previous research experience, to address fundamental challenges in evaluating physical-reasoning beyond mere semantic and geometric adherence.
- · Learn symbolic representations from both in-the-wild and synthetic data capturing the underling physics intrinsics corresponding to objects and environments. The distilled knowledge can serve as coarse signal that can be refined with generative modeling and guide Visual Foundation Models (VFMs) towards more plausible dynamics understanding.

### **Physical Reasoning of Video Generative Models (VGMs)**

Quantifying physics-cognition as an emergent property in video generative modeling.

Pre-print available in arXiv. Research Project under the supervision of Efstratios Gavves.

### Duties/Tasks:

- · Real-world dataset: Capturing simple Newtonian dynamics (falling ball, projectile motion, chaotic pendulum) from real-world controlled experiments.
- Assessing the physical reasoning and plausibility inherent in contemporary Video-Generative (world) Models (VGMs), like COSMOS.
- 10k generated videos: Conditioned the sampling process of four contemporary diffusion-based video generative models (trained with (conditional) flow-matching objectives) on either single or multiple frame(s) for inferring real-world initial conditions (like velocity and acceleration).
- Trajectory Extraction Pipeline: Key aspect for extracting relevant physical information from both real and generated videos. Calculating the 3D trajectory of objects over time/frames, using self-supervised methods in a zero-shot fashion, building upon Vision Foundational Models (for automated object segmentation and open-vocabulary trackers).
- · Going beyond mere pixel-to-pixel evaluation, with the introduction of dynamical and physical invariance scores, for deriving interpretable metrics and faithfully assess the physical reasoning and consistency of VGMs.

Key Findings:

- · Current video generative models often fail to accurately represent physical laws, generating implausible behaviors despite visually realistic and aesthetic outputs.
- MORPHEUS serves as a stepping stone in understanding and addressing the domain gap as to transform generative models into world models with reliable physical cognition capabilities.

## Jeddah, Saudi Arabia

Aug. 2022 - Aug. 2023

Volos, Greece Sep. 2016 - Nov. 2021

University of Amsterdam (UvA)

Jul.2024- Feb. 2025

Amsterdam, Netherlands Aug. 2023 - Present

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### Visual Perception for Autonomous Vehicles - Brightskies Inc.

Remote Collaboration, monitored by Mahmoud Serour (Autonomous Driving Team Lead - CTO of BrightDrive) and

Mohamed Ezzat (Perception Engineer in Brightskies Inc.). Collaboration Initiated by Research Scientist Hakim Ghazzai

(AI Team Lead of our research group).

Duties/Tasks:

- Combining methods for fusing different perception sensor modalities used in autonomous cars, targeting to acquire better accuracy in downstream tasks.
- Multi-Task Learning Hydra network with multiple heads, each corresponding to a different downstream task, to achieve real-time
  performance on computationally constrained systems.

Neural Architecture Search, Meta-Heuristic Optimization, Transformers for Brain Signal	King Abdullah University oj
Decoding	Science and Technology (KAUST)
Graduate Student in applied AI, supervised by Postdoc Fellow Charalampos Antoniadis.	Sep. 2022 - Feb.2023
Projects/Publications:	

- Enhancing DNN models for EEG/ECoG BCI with a Novel Data-Driven Offline Optimization Method.
- Data-Driven Offline Optimization of Deep CNN Models for EEG and ECoG Decoding.

#### AutoML, Efficient Deep Learning Techniques, and Voice Activity Detection

Visiting Student Research Intern, mentored by Postdoc Fellow Charalampos Antoniadis

Projects/Publications:

- TinyML for EEG Decoding on Microcontrollers.
- · Audio-visual Speaker Diarization: Improved Voice Activity Detection with CNN based Feature Extraction.

## **Publications** \_

### Full list is available at Google Scholar

- C. Zhang, D. Cherniavskii, A. Zadaianchuk, A. Tragoudaras, et al. ... E. Gavves. "MORPHEUS: Benchmarking Physical Reasoning of Video Generative Models with Real Physical Experiments" in arXiv.2504.02918
- [2] A. Tragoudaras, T. Aslanidis, E. G. Lionis, M. Orozco González, P. Eustratiadis. "Information Leakage of Sentence Embeddings via Generative Embedding Inversion Attacks", accepted in *SIGIR 2025*, available as pre-print in *arXiv*.2504.16609
- [3] Antonios Tragoudaras, C. Antoniadis, Y. Masoud. "Enhancing DNN models for EEG/ECoG BCI with a Novel Data-Driven Offline Optimization Method" in *IEEE Access, vol. 11, pp. 35888-35900, 2023, doi: 10.1109/ACCESS.2023.3265040*
- [4] A. Tragoudaras, C. Antoniadis, Y. Masoud. "TinyML for EEG Decoding on Microcontrollers" in 2023 IEEE 56th International Symposium on Circuits and Systems (ISCAS)
- [5] K. Fanaras, A. Tragoudaras, C. Antoniadis, Y. Masoud. "Audio-visual Speaker Diarization: Improved Voice Activity Detection with CNN based Feature Extraction" in 2022 IEEE 65th International Midwest Symposium on Circuits and Systems (MWSCAS)
- [6] A. Tragoudaras, P. Stoikos, K. Fanaras, A. Tziouvaras, G. Floros, G. Dimitriou, K. Kolomvatsos, G. Stamoulis. "Design Space Exploration of a Sparse MobileNetV2 Using High-Level Synthesis and Sparse Matrix Techniques on FPGAs" in *MDPI Sensors 22, no. 12: 4318*

### Awards and Honors \_

 ELLIS MSc Honours Program: Award and funding for excellent MSc students to conduct their thesis under their joint supervision of UvA ELLIS unit at an ELLIS partner institution outside of the Netherlands.
 UvA IvI

 Aug. 2022- Aug. 2023
 KAUST Graduate Fellowship: Full tuition support, living allowance, housing, and medical coverage.
 KAUST

## **Teaching Experrience**

### Graduate Teaching Assistant at UvA's MSc AI Program

Assisted in teaching graduate-level (first-year) courses by making sure students understood the material, answering their questions, creating assignments, giving feedback, and grading exams.

Courses:

- Computer Vision 1 (MSc AI) (Aug. 2024 Oct.2024)
- Deep Learning 1 (MSc AI) (Oct. 2024- Dec.2024)
- Fairness, Accountability, Confidentiality & Transparency in AI (MSc AI) (Jan. 2025 Feb. 2025)
- Information Retrieval 1 (MSc AI) (Feb.2025 Mar. 2025)

*VSPR - KAUST* Feb. 2022 - Jul. 2022

UvA, Amsterdam, Netherlands

Aug. 2024 - Present

External Collaboration

Mar.2023-Jun.2023