

# Amirehsan Davoodi

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Tehran, Iran  
(+98) 915 612 6388

September 3, 2025

**To:** Prof. Dr. Christian Ledig  
Chair of Explainable Machine Learning  
Otto-Friedrich-Universität Bamberg  
An der Weberei 5, D-96047 Bamberg  
[christian.ledig@uni-bamberg.de](mailto:christian.ledig@uni-bamberg.de)

## Motivation Letter

Dear Prof. Ledig,

I am writing to apply for the Doctoral Student / PostDoc position at the Chair of Explainable Machine Learning. My research focuses on reliable, data-efficient, and interpretable machine learning for time-series and imaging data, with an emphasis on agentic AI systems and explainable representations. This opportunity aligns strongly with my background and interests in robust deep learning, knowledge representation, and medical AI.

I am currently a PhD candidate in AI at Amirkabir University of Technology (AGML Center) and hold an MSc in AI from USI (Università della Svizzera italiana), Lugano. I combine research and engineering experience (Python, PyTorch, FastAPI, Docker) with a publication track that includes graph learning for fMRI-based autism diagnosis (ASD-GraphNet; Computers in Biology and Medicine, 2025; [doi:10.1016/j.combiomed.2025.110723](https://doi.org/10.1016/j.combiomed.2025.110723)) and an under-review paper on an agentic AI framework for knowledge graph construction (HIDE-KG). During my Masters, I co-founded the startup UbiHealth (covered by USI News) and completed the Innosuisse Entrepreneurship Training in Ticino.

Methodologically, I work on: (i) dual-learning validation loops to improve reliability (text-based reconstruction and re-parsing for knowledge structures), (ii) representation learning for graphs and time-series (including self-/weakly-supervised setups), and (iii) XAI with perturbation-based and counterfactual analyses. These directions map well to your groups topics: robustness/generalization, data efficiency, outlier detection, and interpretable evaluation in healthcare and medical imaging contexts.

I would be excited to contribute to your labs research and teaching, collaborate with the Bamberg Center for AI, and publish at top venues (CVPR/ICCV/ECCV/AAAI/MICCAI). I would welcome the opportunity to discuss how my background can support your groups goals.

Sincerely,

**Amirehsan Davoodi**

# Curriculum Vitae (Concise)

## Education

- PhD Candidate, Artificial Intelligence, Amirkabir University of Technology (AGML Center), Tehran
- MSc, Artificial Intelligence, Università della Svizzera italiana (USI), Lugano

## Selected Research

- HIDE-KG (under review): Hierarchical Dual-learning Entity-clustered Knowledge Graph Construction Using Pre-trained LLMs (agentic AI + dual validation for reliability)
- ASD-GraphNet (2025): fMRI-based autism diagnosis via graph learning (Computers in Biology and Medicine; [doi:10.1016/j.combiomed.2025.110723](https://doi.org/10.1016/j.combiomed.2025.110723))
- Masters thesis: Goal-directed graph generation for anomaly detection on time series (ECG arrhythmia)

## Industry/Applied Experience

- Software/ML Engineer (FastAPI, PyTorch, LangChain, Docker, PostgreSQL/MongoDB)
- Tali AI (Toronto): AI assistant and data platform contributions
- Co-founder, UbiHealth (remote patient monitoring; [USI News](#)); Innosuisse Entrepreneurship Training (Ticino)

## Skills

- ML/DL: PyTorch, scikit-learn, XGBoost; self-/weakly-supervised learning; outlier detection
- XAI: perturbation-based and feature attribution methods; uncertainty estimation
- Systems: Python, FastAPI, Docker; experiment tracking; reproducible pipelines

# Research Proposal (Summary)

**Title:** Dual-Learning and Perturbation-based Explainability for Time-series Graph Representations

**Motivation:** Reliability and interpretability remain key bottlenecks in deploying neural networks for healthcare and related domains. Many signals are temporal and multi-source (wearables, EHR, imaging-derived time-series), where structure emerges across channels and time. Knowledge graphs (KGs) and graph neural networks (GNNs) offer a natural abstraction for capturing dependencies, but require robust validation and explainability.

**Aim:** Develop a dual-learning validation framework and perturbation-based explainability for knowledge graphs derived from time-series data (uni- and multivariate). The approach targets robust generalization, outlier detection, and quantifiable uncertainty while maintaining clinically meaningful interpretability.

**Objectives:**

1. *Time-series to Graph Construction:* Design pipelines that map time-series to graphs via similarity, causality, or learned relational structure; support dynamic/temporal graphs.
2. *Dual-learning Validation:* Extend dual reconstruction (graph-to-text and text-to-graph; or graph-to-signal and signal-to-graph) to assess fidelity, flag hallucinations/spurious edges, and calibrate uncertainty.
3. *Perturbation-based XAI for Graphs:* Introduce a principled perturbation scheme on graph-structured time-series (node/edge/channel/time masking, controlled noise, counterfactual rewiring) to quantify feature importance and stability.
4. *Data Efficiency & Robustness:* Employ self-/weakly-supervised objectives and outlier-aware training to improve performance under limited labels and distribution shifts.
5. *Evaluation in Medical Settings:* Validate on benchmark datasets (ECG, PPG, EEG, fMRI-derived timeseries) with metrics covering accuracy, calibration, and explanation faithfulness.

**Methods:**

- GNNs for temporal graphs; contrastive/self-supervised pretraining; uncertainty via ensembles or evidential methods
- Dual-learning loops for structural fidelity; text/signal reconstruction checks; graph edit distance and information-theoretic criteria
- Perturbation generators respecting temporal and physiological constraints; attribution stability and counterfactual validity tests

**Outcomes:** (i) Reliable graph construction from time-series; (ii) robust models with calibrated uncertainty; (iii) interpretable, perturbation-grounded explanations; (iv) open-source code and reproducible benchmarks; (v) publications targeting CVPR/ICCV/ECCV/AAAI/MICCAI.

## Appendix: Transcripts

Faculty  
of  
Informatics

## Master of Science in Artificial Intelligence

**Amirehsan Davoodi**

Born 8th December 1990



Certification code  
[www.usi.ch/authentication/ANQRW](http://www.usi.ch/authentication/ANQRW)

Lugano  
28th September 2020

Boas Erez  
The Rector of the University

Antonio Carzaniga  
The Dean of the Faculty



Via Buffi 13  
6900 Lugano  
Svizzera

|        |                  |
|--------|------------------|
| da     | Alumni Service   |
| tel    | + 41 58 666 4606 |
| fax    | + 41 58 666 4647 |
| e-mail | alumni@usi.ch    |
| web    | www.usi.ch       |
| data   | 11.12.2020       |

Dear Amirehsan,

**Congratulations! You are now a member of our multicultural Alumni community counting at the moment more than 10'000 graduates.**

**Stay in touch with USI through:**

- **USI Alumni Profile:** update your profile (<https://alumni.lu.usi.ch/LoginScheda.aspx>) with information about your job, your personal data or about your new course of study.
- **E-mail account:** your **USI account (@usi.ch)** will be valid for one year after graduation. From today, you can also take advantage of our e-mail forwarding system dedicated to USI alumni through your new account [name.lastname@alumni.usi.ch](mailto:name.lastname@alumni.usi.ch)
- **Website and Newsletter Alumni:** you can find all the information and the schedule of Alumni events on the website <https://www.usi.ch/en/alumni>. Moreover, you will receive regularly via e-mail, a Newsletter with all the information and news about the Alumni community, alumni Reunions, main USI appointments and the agenda of the events.
- **USI Alumni Group on LinkedIn:** we invite you to join the official group of the USI alumni community: USI Alumni Group on LinkedIn (<https://www.linkedin.com/groups/8250056>) to keep in touch with your former schoolmates and the USI alumni community.
- **USI Alumni Career Stories:** share your career story or read where other former colleagues are working. More than 200 Career Stories are already online. It is a professional network growing everyday.
- **USI Alumni Chapters in the world:** do you work abroad? Check if there is a USI Alumni in your area and contact him/her, you can enter in the USI Community in town. You could also volunteer and become the new Point of Contact in your city <https://www.usi.ch/en/alumni-chapters>

Congratulations for the important goal achieved, we wish you all the best for a future full of success and let us know how we can be of assistance!

Yours sincerely,

**Silvia Invrea**  
Head of USI Alumni Service



**Università della Svizzera italiana**  
**Faculty of Informatics**  
**Master of Science in Artificial Intelligence**  
**Amirehsan Davoodi**

| Course   | Semester     | ECTS | Grade | Recovery |
|--|--------------|------|-------|----------|
| <b>First year</b>                                |              |      |       |          |
| Algorithms & Complexity                          | SA 2017-2018 | 6    | 7     |          |
| Deep Learning Lab                                | SA 2017-2018 |      | 5     | NP       |
| Deep Learning Lab                                | SA 2018-2019 | 3    | 6     |          |
| High-Performance Computing                       | SA 2017-2018 |      | NP    |          |
| High-Performance Computing                       | SA 2018-2019 | 6    | 6     |          |
| Machine Learning                                 | SA 2017-2018 |      | 5.5   | NP       |
| Machine Learning                                 | SA 2018-2019 | 6    | 7.5   |          |
| Mobile Computing                                 | SA 2017-2018 | 6    | 8.5   |          |
| Numerical Algorithms                             | SA 2017-2018 | 3    | 6.5   |          |
| Business Intelligence and Applications           | SP 2018      | 6    | 9.5   |          |
| CPS-Intelligence                                 | SP 2018      | 6    | 8     |          |
| Data Analytics                                   | SP 2018      |      | 5     | NP       |
| Data Analytics                                   | SP 2019      | 6    | 7.5   |          |
| FoMICS-DADSi Summer School on Data Assimilation  | SP 2018      | 3    | pass  |          |
| Physical Computing                               | SP 2018      | 6    | 10    |          |
| Robotics   | SP 2018      |      | 4.5   | NP       |
| Robotics   | SP 2019      | 6    | 7.5   |          |
| Stochastic Methods                               | SP 2018      |      | 5     | NP       |
| Stochastic Methods                               | SP 2019      | 6    | 8.5   |          |
| <b>Second year</b>                               |              |      |       |          |
| Artificial Intelligence                          | SA 2018-2019 | 6    | 7     |          |
| Distributed Algorithms                           | SA 2018-2019 |      | 2     |          |
| Distributed Systems                              | SA 2019-2020 |      | 5     |          |
| Introduction to Data Science                     | SA 2019-2020 |      | 2.5   |          |
| User Experience Design                           | SA 2019-2020 | 6    | 9     |          |
| Business Process Modeling, Management and Mining | SP 2020      | 3    | 10    |          |
| Computer Vision & Pattern Recognition            | SP 2019      | 6    | 8     |          |
| Geometric Deep Learning                          | SP 2019      |      | 3.5   |          |
| Master Thesis (AI)                               | SP 2020      | 30   | 8.5   |          |
| <b>Other courses</b>                             |              |      |       |          |
| Inglese preparazione C1                          | SP 2020      | 0    | 6.5   |          |

**Start date:** August 2017  
**End date:** September 2020  
**Credits total:** 120  
**Cumulative grade:** 8.04  
**Honors:** Magna cum laude

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 Faculty of Informatics  
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 URL: [www.usi.ch](http://www.usi.ch)

Please see the back of this form for the information on the degree, the grading system and document authenticity

### **Degree**

The Master in Artificial Intelligence (a two-year degree in Artificial Intelligence) is awarded by the Faculty of Informatics of the Università della Svizzera italiana, Switzerland.

### **Requirements**

The degree of Master in Artificial Intelligence is granted on completion of a two-year study curriculum.

To obtain it, the student is expected to pass all the courses outlined in the syllabus.

In addition, the candidate is expected to develop an individual project (called *Master thesis* and submit it to the faculty. The work and its report are formally approved and graded by a Faculty Committee.

### **Grading system**

Depending on the type of examination, exam result may be binary (pass/fail) or on a scale from 1 to a maximum of 10 (with half-point increments) where 6 is the pass mark.

Marks equal to or higher than 4 and less than 6 may be admitted to the recovery exam session. Marks lower than 4 must repeat the entire course.

A student who passes a recovery exam receives a grade of 6 for the entire course. This is shown in an additional column in the transcript.

### **Final overall grade**

The final grade for the Master's degree is the result of the average of all the marks obtained in the examination and in the project. The average is calculated by weighting each mark against the number of credits assigned to each course subject in the syllabus.

Degrees are categorised as follows:

- *summa cum laude* (9 – 10)
- *magna cum laude* (8 – 8.99)
- *cum laude* (7 – 7.99)
- *legitime* (6 – 6.99)

### **European Credit Transfer System (ECTS)**

Study progress is also assessed and quantified on the basis of the 'European Credit Transfer System' (ECTS), according to which a candidate must accumulate approximately 60 credits each year.

The Masters of Science in Artificial Intelligence is composed of a total of 120 credits.

The points corresponding to each subject will be credited when the relative examination is passed with a mark that is equal or higher than 6.

### **Information**

In compliance with the 1992 Swiss Privacy Act, the information contained in this certificate may be issued to third parties exclusively by explicit permission of the person concerned.

### **Authentication**

The certificate is printed on white paper, and the 'Università della Svizzera italiana' seal is embossed in the lower right-hand corner.





## Diploma Supplement

Il presente supplemento al diploma è stato sviluppato dalla Commissione Europea, dal Consiglio d'Europa e dall'UNESCO/CEPES. Lo scopo del supplemento è di fornire dati indipendenti atti a migliorare la trasparenza internazionale dei titoli (diplomi, lauree, certificati ecc.) e a consentire un equo riconoscimento accademico e professionale. E' stato progettato in modo da fornire una descrizione della natura, del livello, del contesto, del contenuto e dello status degli studi effettuati e completati dallo studente identificato nel titolo originale al quale questo supplemento è allegato. Il certificato esclude ogni valutazione discrezionale, dichiarazione di equivalenza o suggerimenti relativi al riconoscimento. Le informazioni sono fornite in otto sezioni. Qualora non sia possibile fornire alcune informazioni, ne sarà data la spiegazione.

The Diploma Supplement was developed by the European Commission, Council of Europe and by UNESCO/CEPES. The purpose of the supplement is to provide sufficient independent data to improve the international transparency and fair academic and professional recognition of qualifications (diplomas, degrees, certificates etc.). It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It is free from any value-judgements, equivalence statements or suggestions about recognition. Information is provided in eight sections. Where information is not provided, an explanation will give the reason why.

### 1. Dati anagrafici

Information identifying the holder of the diploma

|     |   |     |  |
|-----|---|-----|--|
| 1.1 | Cognome(i)<br>Family name(s)<br><br><b>Davoodi</b>        | 1.2 | Nome(i)<br>First name(s)<br><br><b>Amirehsan</b>               |
| 1.3 | Data di nascita<br>Date of birth<br><br><b>08.12.1990</b> | 1.4 | Numero di matricola<br>Student number<br><br><b>17-980-418</b> |

## 2. Informazioni sul diploma

- 2.1 Qualifica accademica e titolo di studio rilasciato (per intero/abbreviato)  
**Master of Science in Informatics USI / M Sc inf.**
- 2.2 Classe o area disciplinare della qualifica  
**Major in Artificial Intelligence**
- 2.3 Nome e stato dell'istituzione che rilascia il diploma (in lingua originale)  
**Università della Svizzera italiana (USI), università riconosciuta dallo Stato.**
- 2.4 Nome e stato dell'istituzione che gestisce gli studi se diversa dalla precedente  
**-**
- 2.5 Lingua/e ufficiali di insegnamento e di accertamento della preparazione  
**Inglese**

## 3. Informazioni sul livello del diploma

- 3.1 Livello del diploma  
**Secondo titolo accademico (livello 2 delle nqf.ch-HS, v. punto 8)**
- 3.2 Durata dello studio: 1 credito ECTS = 25-30 ore di studio  
**120 crediti ECTS = 4 semestri di studio a tempo pieno**
- 3.3 Requisiti di ammissione:  
**Diploma di Bachelor o equipollente riconosciuto dall'Università della Svizzera italiana**

## 4. Informazioni sul curriculum di studio e sui risultati conseguiti

- 4.1 Modalità di frequenza e di didattica utilizzata  
**Tempo pieno**
- 4.2 Requisiti per il conseguimento del titolo  
**Regolamento degli studi della Facoltà di scienze informatiche; v. [http://www.inf.usi.ch/it/regolamenti\\_tutti](http://www.inf.usi.ch/it/regolamenti_tutti)**
- 4.3 Curriculum, crediti, valutazioni e note conseguite  
**Vedi transcript**
- 4.4 Sistema di valutazione, distribuzione delle note  
**La nota di valutazione è scalare. La nota è definita secondo una scala da 1 a 10, con incrementi di 0.5; sono considerate insufficienti le note inferiori a 6. Alcune note sono di tipo binario (passato/respinto). La nota degli esami della sessione di recupero è di tipo binario (passato/respinto).**
- 4.5 Valutazione finale conseguita  
**Vedi transcript**

## 5. Informazioni sulla funzione del titolo di studio

- 5.1 Accesso ad ulteriori studi  
**Accesso agli studi di dottorato conformemente alle condizioni del Regolamento degli studi.**
- 5.2 Status professionale conferito dal titolo  
**Non regolamentato**



## 2. Information identifying the diploma

- 2.1 Name of qualification and title conferred with official abbreviation  
**Master of Science in Informatics USI / M Sc inf.**
- 2.2 Main field(s) of study for the qualification  
**Major in Artificial Intelligence**
- 2.3 Name and status of the awarding institution (in original language)  
**Università della Svizzera italiana (USI), State recognized University.**
- 2.4 Name and status of institution administering studies  
**-**
- 2.5 Languages of instruction/examination  
**English**

## 3. Information on the level of the qualification

- 3.1 Level of the qualification:  
**Second academic degree (Level 2 of the Qualifications Framework for the Swiss Higher Education Area nqf.ch-HS, see point 8)**
- 3.2 Official length of studies: 1 ECTS credit = 25-30 hours of study  
**120 ECTS credits = 4 semesters of full-time study**
- 3.3 Entry requirements:  
**Bachelor's degree or equivalent degree recognized by the Università della Svizzera italiana**

## 4. Information on the programme contents and results obtained

- 4.1 Mode of study  
**Full-time**
- 4.2 Programme requirements  
**Study Regulations awarded by the Faculty of Informatics; for further details see [http://www.inf.usi.ch/regolamenti\\_tutti](http://www.inf.usi.ch/regolamenti_tutti)**
- 4.3 Programme details and individual grades/marks obtained  
**Please refer to transcript**
- 4.4 Grading scheme and grade distribution  
**In general, grades are expressed on a scale from 1 to 10, increasing in units of 0.5, with 6 being the passing grade. However, some exams are evaluated with a simple Pass/Fail grade. Recovery exams are evaluated with a Pass/Fail grade.**
- 4.5 Overall classification of the qualification  
**Please refer to transcript**

## 5. Information on the function of the qualification

- 5.1 Access to further studies  
**Access to Doctor Studies subject to the conditions in Study Regulations.**
- 5.2 Professional status  
**Not regulated**

## 6. Informazioni aggiuntive

### Additional information

- 6.1 Per una visione completa di tutti i corsi seguiti presso l'Università della Svizzera italiana vedere il transcript  
For a summary of all courses attended as the Università della Svizzera italiana, please refer to the transcript
- 6.2 Altre fonti d'informazioni: Università della Svizzera italiana, <http://www.usi.ch>. Centro d'informazione nazionale svizzero per le questioni riguardanti l'equivalenza e il riconoscimento dei titoli di studio (Swiss ENIC): <http://www.crus.ch/engl/enic/contents.html>  
Further informations sources: Università della Svizzera italiana, <http://www.usi.ch>.  
Recognition Information Centre / Swiss ENIC: <http://www.crus.ch/engl/enic/contents.html>

## 7. Certificazione

### Certification

7.1 Data  
Date

01.12.2020

7.3 Decano della Facoltà  
Dean of the Faculty

Antonio Carzaniga

7.2

Firma

Signature



7.4

Timbro ufficiale

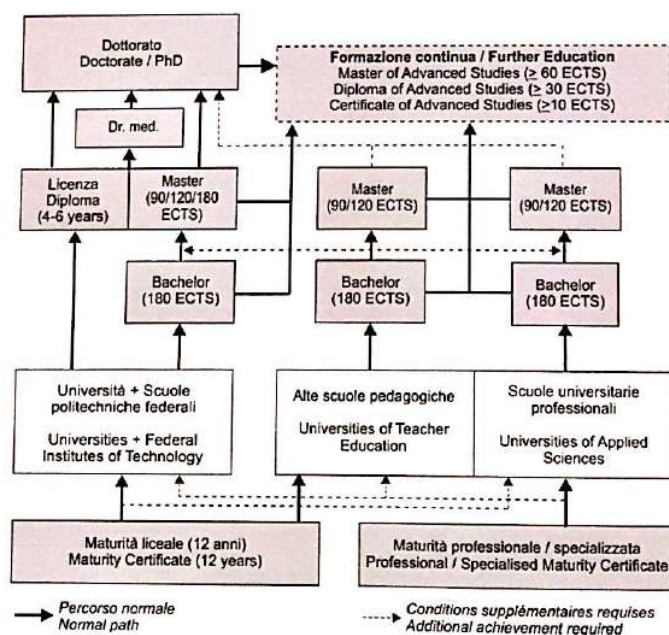
Seal



Università  
della  
Svizzera  
italiana

## 8. Informazioni sul sistema d'insegnamento superiore in Svizzera

### Information on the Swiss Higher Education System



For any further information concerning the Qualifications Framework for the Swiss Higher Education Area nqf.ch-HS see [www.qualifikationsrahmen.ch](http://www.qualifikationsrahmen.ch)