Koorosh Aslansefat

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Biography

Koorosh Aslansefat is an Assistant Professor of Computer Science and a member of the Dependable Intelligent System Group (DEIS) in the University of Hull. He received MSc degree in control engineering from Shahid Beheshti University, Tehran, Iran, in 2014. He got a fellowship with Grant No. 723764 for the EU H2020 project entitled: GO0D MAN (aGent Oriented Zero Defect Multi-stage mANufacturing) from 2016 to 2018. In 2018, he got a Studentship Award from EDF Energy R&D UK to do a PhD at the University of Hull and have an industrial collaboration with EDF Energy for a project entitled: **DREAM (Data-driven Reliability-centred Evolutionary Automated Maintenance for Offshore Wind Farms).** In his PhD career, he managed to get the IET Leslie H. Paddle Award for being an Outstanding Researcher for his research works on Real-time dependability evaluation and the DREAM project. In 2021, in his write-up year, he became a Research Associate and as a named researcher got a fellowship with Grant No. 101017258 for another EU H2020 project entitled: (SESAME) Safe Multi-Robot Systems. In this position, he managed to get a **Post-Doctoral Enrichment Award** from the Alan Turing Institute for his innovative research on the safety evaluation of machine learning known as **SafeML**. SafeML was recently recommended in the new German Industry Standard for Machine Learning Uncertainty Quantification (DIN SPEC 92005). He later developed **XWhy** for Robust ML Explainability, **TrustLLM** for in-context trustworthiness monitoring

Research Interests

- Responsible AI, AI Safety, Explainability and Performance Assessment

- Data-driven Fault Detection, Diagnosis, and Prognosis

- Dependability Evaluation and Improvement and Fault Tolerant Design

- Optimization of Arterial Intelligence Methods and Evolutionary Algorithms

- Probabilistic Modelling (In particular Markov Modelling)

- Safe and Secure Robotics

Education

2018 - 2023	Ph.D. Student and Researcher in Dependability Modeling and Assessment, Department of Computer Science and Technology, University of Hull, Kingston upon Hull, United Kingdom. **PhD Thesis**: Addressing Complexity and Intelligence in Systems Dependability Evaluation [Link]. <u>Supervisor</u>: Prof. Yiannis Papadopoulos
2012 - 2014	MSc. in Control Engineering, Shahid Beheshti University (SBU), Tehran, Iran, Total GPA: 16.90 (**Ranked 5th**). **MSc Thesis:** A Novel Approach for Reliability and Safety Evaluation of Control Systems with Dynamic Fault Tree <u>Supervisor:</u> Dr. G.R. Latif-Shabgahi (Mark: 20/20)
2007 - 2011	BSc. in Maritime Electronic and Communication, Chabahar Maritime University (CMU), Chabahar, Iran, Total GPA: 15.86/20 (**Ranked 1st**). **BSc Thesis:** Implementation of Ziegler-Nichols Control Method on AVR Microcontroller for Control Hovering Maneuver of Underwater Vehicle. (One test of this system is available on YouTube)

Supervisor: Dr. S. Heidari (Mark: 20/20)

Professional Experience

[2023 - Present] Assistant Professor in Computer Science, University of Hull, UK [Link]. Teaching (Responsible AI, Applied AI, Real-Time Dependable Systems, Safety-Critical Systems).

[2021 - 2023] Research Associate in H2020 EU Project, Grant No. 101017258, entitled: SESAME (Secure and Safe Multi-Robot Systems), Department of Computer Science and Technology, University of Hull, UK [Link].

[2018 - 2022] Actively collaborating with EDF Energy R&D London/France to use the proposed approach in the PhD thesis for the Teesside Offshore Wind Farm, UK.

[2016 - 2018] Research Assistant in H2020 EU Project, Grant No. 723764, entitled: GO0D MAN (aGent Oriented Zero Defect Multi-stage mANufacturing), Department of Electronic and Computer Engineering, New University of Lisbon, Lisbon, Portugal [Link].

[2014 - 2016] Research Assistant working on Performance Assessment of Alarm Systems, Department of Control Engineering, Shahid Beheshti University (SBU), Tehran, Iran.

[2014 - 2016] Cooperative member of the national project named "Dependability Evaluation of Iran's National Grid" for Iranian Grid Management Center (IGMC) of ministry of energy in Iran.

[2014 - 2016] Active member of the national project named "Analysis Last Decade Events of Iran's National Grid" Iranian Grid Management Center (IGMC) of ministry of energy in Iran.

Language

Persian	Native language
English	Fluent speaking and writing (with IELTS certificate)
Portuguese	A1/A2

Honors

✓ The Alan Turing Institute Post-Doctoral Enrichment Awards 2021 [Link_1], [Link_2].

✓ IET Leslie H. Paddle Award for an Outstanding Researcher, 2020 [Link].

✓ Best Paper Award for the paper entitled: "Combining Drone-based Monitoring and Machine Learning for Online Reliability Evaluation of Wind Turbines" at the IEEE International Conference on Computing, Electronics & Communications Engineering 2022 (IEEE iCCECE '22), University of Essex, Southend Campus, UK.

✓ Nominated for the Best Paper Award for the paper entitled: "SafeML: Safety Monitoring of Machine Learning Classifiers Through Statistical Difference Measures. In: Model-Based Safety and Assessment.", at the 7th International Symposium on Model-Based Safety and Assessment, Lisbon, Portugal [Link].

✓ Best Poster Award for the paper entitled: "DREAM: Data-driven Reliability-centred Evolutionary Automated Maintenance for Offshore Wind Farms" at the Global Offshore Wind 2019, RenewableUK, London [Link].

✓ Ranked 1st in Electronic Engineering Department in BSc Degree, Chabahar Maritime University, Iran.

✓ Achieving 2nd position in national Olympiad of IDEAS BAAZAR for "Designing a National Game", Amirkabir University of Technology (AUT), Tehran, Iran, Nov. 2015.

⚙ Grants: Total: £140K

- **Principal Investigator**
  - AKT: **TRUST-LLM: Tailored Responsible Use of Safe and Trustworthy LLM for Planning Law Institutional Memory Management** with Walton&Co Ltd. (Approved) [Total: £35K] (Link).
  - Vital Knowledge Exchange Visits: Bolstering Ongoing Collaborative Responsible AI Projects at IIT-M and UoH (Approved) [Total: £15K] (Link).
- **Co-Investigator**
  - EPSRC iCASE PhD Studentship with QinetiQ (via Newcastle University): Engaged in ongoing research funded by the EPSRC with a grant of **£140K** since January 2024. This project aims to develop a framework for **LLM Assurance. My role involves the expansion of SafeML for LLM Assurance** (Link 1, Link 2).
  - Digital Twin Through Physics-Informed Deep Learning For Offshore Wind Turbine Gearing Fault Diagnosis and Prognosis for collaboration of IIT-M and UoH (Approved) [Total: £10K] (Link).

⚙ Academic Projects – Research Reproducibility

❖ **Projects at the University of Hull, 2018-Present, Hull, UK**

SafeML: Exploring Techniques for Safety Monitoring of Machine Learning Classifiers

SafeML GitHub Repository: https://github.com/ISorokos/SafeML
SafeML Extension for Time-Series: https://github.com/n-akram/TimeSeriesSafeML

SafeDrones: A Framework for Reliability/Safety Modelling and Evaluation of Multicopters (Multi-rotor Drones) and Electric powered Vertical TakeOff and Landing (eVTOL) Aircrafts.

SafeDrones GitHub Repository: https://github.com/koo-ec/SafeDrones

XWhy: eXplain Why with SMILE -- Statistical Model-agnostic Interpretability with Local Explanations

XWhy GitHub Repository (Currently Private): https://github.com/koo-ec/xwhy

HDFT: Hierarchical Dynamic Fault Tree -- A Semi-Markov Process-based Hierarchical Solution for Dynamic Fault Trees.

HDFT GitHub Repository: https://github.com/koo-ec/Hierarchical-Dynamic-Fault-Tree

To see more projects please check my GitHub Repository.

Teaching

1. Safety-Critical Systems (L6 – Module Leader), 2024 – (Course Designing Stage), University of Hull.
2. Programming Portfolio (L4 with Simon Gray), 2023, University of Hull.
3. Real-Time Dependable Systems (at Post Graduate level (L7) with Prof. Yiannis Papadopoulos supervision), 2023, University of Hull.
4. Real-Time Dependable Systems (at Post Graduate level with Prof. Yiannis Papadopoulos's supervision), 2022, University of Hull.
5. Real-Time Dependable Systems (at Post Graduate level with Prof. Yiannis Papadopoulos's supervision), 2021, University of Hull.
6. Dependability modelling and evaluation through Markov theorem, 2014, Shahid Beheshti University, Tehran, Iran.

7. Real-Time Control Systems, (at Post Graduate level), 2014, Shahid Beheshti University, Tehran, Iran.
8. Teacher Assistant of "Reliable Control Systems" Course (at Post Graduate level), 2014, Shahid Beheshti University, Tehran, Iran.
9. Teacher Assistant of "Real-Time Control" Course (at Post Graduate level), 2013, Shahid Beheshti University, Tehran, Iran.

PhD Students

- **First Supervisor:**
  1. Kuniko Paxton (DAIM Scholarship): Redefining Fairness in ML: A Pigment-Based Approach to Skin Colour Analysis, [2021-2025] {Awards: Alan Turing-Roche [Link]}.
  2. Tooba Ali Zahed (DAIM Scholarship): A Novel Safe Medical LLM through Combining Neuro-symbolic AI-based Hallucination Avoidance and SafeML for Healthcare [2024-2028].
- **Second Supervision:**
  3. Louis Donaldson (AURA Scholarship): OPtimization EXplainability (OPEX) for Maintenance Scheduling of Offshore Wind Farms [2023-2027] (with Yiannis Papadopoulos).
  4. Connor Walker: SafeLLM: Safety Monitoring for Large Language Models: A Case Study of Offshore Wind Maintenance [2021-2026] (with Yiannis Papadopoulos).
  5. Parvin Ghaffarzadeh (DAIM Scholarship): Integrating ML-Based Remote Monitoring System to Enhance Bone Health in Peri- and Post-Menopausal Women [2023-2027] (with Ali Dostan).
  6. Victoria Sherratt: Deep Meme Clustering with Phrase Vectors and Fine-grained Image Similarity" [2020-2024] (with Nina Dethlefs).
  7. Hari Neupane (Microsoft): Responsible Large Language Models (with Bhupesh Mishra).
  8. Omondi Makalliwa, Assurance of Autonomous Systems (with Dhaval Thakker).

Publications   Articles: 49, Citations: 499, H-Index: 14, I10-Index: 15

Selected Journal Papers

To have the full list of publications, please check Google Scholar.

- ❖ Walker, C., Rothon, C., **Aslansefat, K.**, Papadopoulos, Y., & Dethlefs, N. (2024). SafeLLM: Domain-Specific Safety Monitoring for Large Language Models: A Case Study of Offshore Wind Maintenance. In IOP Journal of Physics 2875(1), 1-19.

- ❖ Paxton, K., **Aslansefat, K.**, Thakker, D., & Papadopoulos, Y. (2024). Measuring AI Fairness in a Continuum Maintaining Nuances: A Robustness Case Study. IEEE Internet Computing 28(5), 11-19.

- ❖ **Aslansefat, K.**, Hashemian, M., Walker, M., Akram, M. N., Sorokos, I., & Papadopoulos, Y. (2023). Explaining black boxes with a SMILE: Statistical Model-agnostic Interpretability with Local Explanations. IEEE Software, 41(1), 87-97.

- ❖ Faraji Niri, M., **Aslansefat, K.**, Haghi, S., Hashemian, M., Daub, R., & Marco, J. (2023). A Review of the Applications of Explainable Machine Learning for Lithium–Ion Batteries: From Production to State and Performance Estimation. Energies, 16(17), 6360.

- ❖ **Aslansefat, K.**, Kabir, S., Abdullatif, A., Vasudevan, V., & Papadopoulos, Y. (2021). Toward improving confidence in autonomous vehicle software: A study on traffic sign recognition systems. **IEEE Computer**, 54(8), 66-76.

- ❖ Gheraibia, Y., Kabir, S., **Aslansefat, K.**, Sorokos, I., & Papadopoulos, Y. (2019). Safety+ AI: A Novel Approach to Update Safety Models Using Artificial Intelligence. **IEEE Access**, *7(1)*, 135855-135869.

- ❖ Kabir, S., **Aslansefat, K.**, Sorokos, I., Papadopoulos, Y. & Konur, S. (2020). A Hybrid Modular Approach for Dynamic Fault Tree Analysis. **IEEE Access**, 8(1), 97175-97188.

- **Aslansefat, K.**, & Latif-Shabgahi, G. R. (2020). A hierarchical approach for dynamic fault trees solution through semi-Markov process. **IEEE Transactions on Reliability**, *69*(3), 986-1003.

- Akhlaghi, Y. G., Badiei, A., Zhao, X., **Aslansefat, K.**, Xiao, X., Shittu, S., & Ma, X. (2020). A constraint multi-objective evolutionary optimization of a state-of-the-art dew point cooler using digital twins. **Energy Conversion and Management**, 211, 112772.

- **Aslansefat, K.**, Gogani, M. B., Kabir, S., Shoorehdeli, M. A., & Yari, M. (2020). Performance evaluation and design for variable threshold alarm systems through semi-Markov process. *ISA Transactions*, *97*, 282-295.

- Akhlaghi, Y. G., **Aslansefat, K.**, Zhao, X., Sadati, S., Badiei, A., Xiao, X., ... & Ma, X. (2020). Hourly performance forecast of a dew point cooler using explainable Artificial Intelligence and evolutionary optimisations by 2050. **Applied Energy**, 281, 116062.

Selected Conference Papers

- **Aslansefat, K.**, Nikolaou, P., Walker, M., Akram, M. N., Sorokos, I., Reich, J., ... & Papadopoulos, Y. (2022). SafeDrones: Real-time Reliability Evaluation of UAVs using Executable Digital Dependable Identities. In International Symposium on Model-Based Safety and Assessment (pp. 252-266). Springer.

- **Aslansefat, K.** & Papadopoulos, Y. (2019). DREAM: Data-driven Reliability-centred Evolutionary Automated Maintenance for Offshore Wind Farms, Global Offshore Wind 2019 – London.

- Kabir, S., **Aslansefat, K.**, Sorokos, I., Papadopoulos, Y., & Gheraibia, Y. (2019). A Conceptual Framework to Incorporate Complex Basic Events in HiP-HOPS. International Symposium on Model-Based Safety and Assessment, Lecture Notes in Computer Science 11842: 109-124, Springer, ISBN: 978-3-030-32871-9.

- Kabir, S., Sorokos, I., **Aslansefat, K.**, Papadopoulos, Y., Gheraibia, Y., Wei, R. (2019). A Runtime Safety Analysis Concept for Open Adaptive Systems. International Symp. on Model-Based Safety Assessment, Lecture Notes in Computer Science 11842:332-346, Springer, ISBN: 978-3-030-32871-9.

- **Aslansefat, K.**, Marques, F., Mendonça, R., & Barata, J. (2019). A Markov process-based approach for reliability evaluation of the propulsion system in multi-rotor drones. In Doctoral Conference on Computing, Electrical and Industrial Systems (pp. 91-98). Springer.

- **Aslansefat, K.**, Kabir, S., Gheraibia, Y., & Papadopoulos, Y. (2020). Dynamic Fault Tree Analysis: State-of-the-Art in Modeling, Analysis, and Tools. Reliability Management and Engineering, 73-112.

- **Aslansefat, K.** & Papadopoulos, Y. (2020). A Conceptual Framework for Data-driven Reliability-centred Evolutionary and Automated Maintenance of Offshore Wind Farms. EERA DeepWind'2020, Norway.

- **Aslansefat K.**, Sorokos I., Whiting D., Tavakoli Kolagari R., Papadopoulos Y. (2020) SafeML: Safety Monitoring of Machine Learning Classifiers through Statistical Difference Measures. In: Model-Based Safety and Assessment. IMBSA 2020. Lecture Notes in Computer Science, vol 12297. Springer.

- Akram, M. N., Ambekar, A., Sorokos, I., **Aslansefat, K.**, & Schneider, D. (2022). StaDRe and StaDRo: Reliability and Robustness Estimation of ML-Based Forecasting Using Statistical Distance Measures. In International Conference on Computer Safety, Reliability, and Security (pp. 289-301). Springer.

- Farhad, A. H., Sorokos, I., Schmidt, A., Akram, M. N., **Aslansefat, K.**, & Schneider, D. (2022). Keep your Distance: Determining Sampling and Distance Thresholds in Machine Learning Monitoring. In Model-Based Safety and Assessment. IMBSA 2022. Lecture Notes in Computer Science, Springer.

- Walker, C., Rothon, C., **Aslansefat, K.**, Papadopoulos, Y., & Dethlefs, N. (2022). A Deep Learning Framework for Wind Turbine Repair Action Prediction Using Alarm Sequences and Long Short Term Memory Algorithms. In Model-Based Safety and Assessment. IMBSA 2022. Lecture Notes in Computer Science, Springer.

❖ **Aslansefat, K.**, Nikolaou, P., Walker, M., Akram, M. N., Sorokos, I., Reich, J., ... & Papadopoulos, Y. (2022). SafeDrones: Real-Time Reliability Evaluation of UAVs using Executable Digital Dependable Identities. In Model-Based Safety and Assessment. IMBSA 2022. Lecture Notes in Computer Science, Springer.

Certificates

Short Courses

1. Fault Detection, Identification & Tolerant in Industrial Systems, 2013, IEEE (Iran Section), Sharif University of Technology, Tehran, Iran (Duration: 6h).
2. Reliability Analysis of Computer-based Systems using Dynamic Fault Tree, 2014, IEEE, (Mark: 85/100), 2014, IEEE e-Learning Online Course (Duration: 3h).
3. Fault Diagnosis in Nonlinear Systems, Novel Approaches, 2015, IEEE (Iran Section), Sharif University of Technology, Tehran, Iran (Duration: 6h).
4. Complex System Reliability and Safety Assessment: Methods, Models and Open Issues, 2016, International Conference of Reliability Engineering, Tabriz, Iran, (Duration: 4h).
5. Remaining Useful Life Estimation, 2016, International Conference of Reliability Engineering, Tabriz, Iran, (Duration: 4h).

Long Courses

1. MATLAB (Programming, Simulink, GUI, xTarget PC, Virtual Reality), (Mark: 100/100), 2008, Jahad-Daneshgahi, University of Science and Technology, Tehran, Iran, (Duration: 30h)
2. PCB & Circuit Design with Protel DXP Software, (Mark: 100/100), 2009, Tehran Institute of Technology, Tehran, Iran, (Duration: 29h)
3. Digital Circuit Design, (Mark: 85/100), 2009, Tehran Institute of Technology, Tehran, Iran, (Duration: 40h)
4. FPGA Programming by VHDL, (Mark: 95/100), 2009, Tehran Institute of Technology, Tehran, Iran, (Duration: 45h)
5. 8051 Microcontroller Programming, (Mark: 100/100), 2009, Tehran Institute of Technology, Tehran, Iran, (Duration: 70h)
6. AVR Microcontroller Programming, (Mark: 93/100), 2009, Tehran Institute of Technology, Tehran, Iran, (Duration: 50h)
7. ARM Microcontroller Programming, (Mark: 89/100), 2009, Tehran Institute of Technology, Tehran, Iran, (Duration: 35h)
8. Practical design with Texas Instrument DSP processors, (Mark: 19.5/20), 2010, Ministry of Industries and Mines, Tehran, Iran. (Duration: 50h)
9. Risk and Reliability Engineering, 2018, **University of Strathclyde**, UK. (Duration: 50h)

Editorial Experience

Peer Review Awards: Top Peer Review Awards in Computer Science, Engineering, and Cross-Field from Publons, 2019 [Link].

Book Editorial: Papadopoulos, Y., Aslansefat, K., Katsaros, P., & Bozzano, M. (2019). Model-Based Safety and Assessment, Springer. ISBN: 978-3-030-32871-9.

My Editor Roles:

Guest Associate Editor: Ensuring AI Safety in High-Stakes Autonomous Systems: Challenges and Solutions in Frontiers in Robotics and AI, 2023 [Link].

Guest Associate Editor: Data Manager and Service Science as Requirements for Industry 4.0 in Frontiers in Manufacturing Technology, 2023 [Link].

Verified Peer Records:

59 **ISA Transactions**
55 **IEEE Systems Journal**
52 **IEEE Access**
13 **International Journal of Systems Assurance Engineering and Management**
12 **IEEE Sensors Journal**
 6 **IEEE Transactions on Reliability**
 5 **Algorithms** and more.

(Total: 250 Verified Peer Reviews since 2018 [Link])

Verified Editorial Records: 5 for the International Symposium on Model-Based Safety and Assessment.

Conference Organisation

- ❖ Program Committee, Sixth International Workshop on Artificial Intelligence Safety Engineering (WAISE 2024), aligned with SafeComp 2024 Conference.
- ❖ Organising Committee, 2nd Yorkshire Innovation in Science and Engineering Conference (YISEC 2024).
- ❖ Program Committee, 7th International Symposium on Model-Based Safety and Assessment (IMBSA 2020)
- ❖ Organising Committee, 6th International Symposium on Model-Based Safety and Assessment (IMBSA 2019).
- ❖ Organising Committee, 9th Advanced Doctoral Conference on Computing, Electrical & Industrial Systems (2017).

Membership

IEEE Student Member
Member of Iranian Mathematical Society

Sports

CMAS-ISA 1 Star Diver Certificate, 2011, Chabahar Diving School, Chabahar, Iran.

References

References will be provided upon request.