# Job Opportunity as a Student Assistant

May 29, 2020

We are looking for a talented student assistant to apply formal methods in the context of wireless networks. The applicant is expected to pursue a Master's degree in computer science or similar as well as to have background in formal modelling and verification (familiarity with Probabilistic Timed Automata (PTA), Markov Decision Process (MDP), etc) and communication networks and protocols (in particular routing).

**Job description:** Wireless networks are on the rise, from laptops and smart phones in use everywhere, to sensor networks generating large amount of data. One of the contemporary wireless networks that our focus is on is Mobile Ad-hoc NETworks (MANETs). These networks have gained popularity and are increasingly applied in a wide range of application areas, such as public safety, emergency response networks, or disaster recovery. Due to the safety critical applications of such networks, their reliability, performance and efficiency are of high importance. Therefore, we apply formal methods to analyse these systems and provide assurance regarding their safety. The tasks in this study consist of:

- Formal modelling of MANET routing protocols, e.g., Optimised Link State Routing (OLSR), using PTA (in Modest modelling language [1]).

- Formal verification and analysis of such protocols w.r.t. reliability and performance using probabilistic model checking, e.g., mcsta, Storm.

- Formal analysis of protocols efficiency (energy consumption) by enriching their PTA models with battery models [2, 3, 4].

If you are interested in the position or have further questions, please contact Dr. Mojgan Kamali (mojgan.kamali@cs.rwth-aachen.de).

# References

[1] Henrik C. Bohnenkamp, Pedro R. D'Argenio, Holger Hermanns, and Joost-Pieter Katoen. MODEST: A compositional modeling formalism for hard and softly timed systems. *IEEE Trans. Software Eng.*, 32(10):812–830, 2006.

[2] Juan A. Fraire, Gilles Nies, Carsten Gerstacker, Holger Hermanns, Kristian Bay, and Morten Bisgaard. Battery-aware contact plan design for LEO satellite constellations: The ulloriaq case study. *TGCN*, 4(1):236–245, 2020.

[3] Morten Bisgaard, David Gerhardt, Holger Hermanns, Jan Krcál, Gilles Nies, and Marvin Stenger. Battery-aware scheduling in low orbit: the gomx-3 case. *Formal Asp. Comput.*, 31(2):261–285, 2019.

[4] Holger Hermanns, Jan Krcál, and Gilles Nies. How is your satellite doing? battery kinetics with recharging and uncertainty. *LITES*, 4(1):04:1–04:28, 2017.