



Distributed Computing and Systems
Chalmers University of Technology
Gothenburg, Sweden

PhD position -- applications deadline May 31, 2017

http://www.cse.chalmers.se/~ptrianta/APODOSIS_WASP@DCS_CSE_CTH2017web.pdf

Project title: *APODOSIS - Adaptive Data Summaries for Autonomous Stream Processing Systems*

Research Group: *Distributed Computing and Systems Group, Computer Science and Engineering, Chalmers University, Gothenburg, Sweden*

Context: The project is supported by the WASP graduate School <http://wasp-sweden.org/graduate-school/>, which aims at providing added value on top of the existing PhD programs at the partner universities, with unique opportunities for students who are dedicated to achieving international research excellence with industrial relevance.

Link to applications portal (including the other 6 WASP-supported positions at Chalmers): <http://www.chalmers.se/en/about-chalmers/vacancies/?rmpage=job&rmjob=5052> proj. C5

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Project summary: Continuous data generated in IoT-based systems (e.g. vehicular, energy and production systems) require continuous, i.e. stream processing and analysis. The project will address a core question of stream processing big data applications in autonomous digitalized systems: if data arrives continuously from many sources and only a bounded portion of it can be temporarily persisted for analysis tasks that will be defined and run at a later stage, what should be persisted to maximize the utility of such analysis? I.e. as the volumes of data are growing bigger, methods that can maintain appropriate summaries are needed, in order to support the continuous analysis. How to generate those in a fashion that is adaptive to the system behavior is challenging and is expected to have large impact in adaptive, autonomous systems. In the project we will provide methods for efficient stream processing and data structures to facilitate that and to connect with real-world use-cases.

Relevance, related projects of the team: *SSF Fic* (main WP of the team: processing infrastructure for autonomous systems, including production systems; with MDH –coordinator, UU), *WASP project STAMINA* (Processing and analysis of data streams in Advanced Metering Infrastructures for Awareness and Adaptiveness in electricity grids; with Gothenburg Energy), *FFI project OODIDA* (On-Board Off-Board continuous Data Analytics, with VolvoCC –coordinator, VolvoTT, FCC), *VR project HARE* (self-deploying and Adaptive Data Streaming Analytics in Fog Architectures).

Examples of related research publications of the team:

- Vincenzo Gulisano, Yiannis Nikolakopoulos, Marina Papatriantafilou, and Philippos Tsigas. 2016. Scalejoin: A deterministic, disjoint-parallel and skew-resilient stream join. *IEEE Transactions on Big Data* (2016).
- Vincenzo Gulisano, Yiannis Nikolakopoulos, Ivan Walulya, Marina Papatriantafilou, and Philippos Tsigas. 2015. Deterministic Real-time Analytics of Geospatial Data Streams through ScaleGate

Objects. In Proceedings of the 9th ACM International Conference on Distributed Event-Based Systems (DEBS '15 - Grand Challenge Best Solution Award)

- Vincenzo Gulisano, Yiannis Nikolakopoulos, Daniel Cederman, Marina Papatrantafileou, Philippas Tsigas: Efficient data streaming multiway aggregation through concurrent algorithmic designs and new abstract data types. CoRR abs/1606.04746 (2016) – under revision for ACM Transactions on Parallel Computing.
- Daniel Cederman, Vincenzo Gulisano, Yiannis Nikolakopoulos, Marina Papatrantafileou, Philippas Tsigas: Brief announcement: concurrent data structures for efficient streaming aggregation. ACM SPAA 2014
- Yiannis Nikolakopoulos, Marina Papatrantafileou, Peter Brauer, Martin Lundqvist, Vincenzo Gulisano, Philippas Tsigas: Highly Concurrent Stream Synchronization in Many-core Embedded Systems. MES@ ACM ISCA 2016.

Details about employment, host university and location: a PhD student position is limited to five years and normally includes 20% departmental work, mostly teaching duties. The salary for the position is as specified in Chalmers' general agreement for PhD student positions. Currently the starting salary is around 30,000SEK a month before tax. The position is intended to start in fall 2017.

The department has about 260 employees from more than 30 countries. The research spans the whole spectrum, from theoretical foundations to applied systems development. There is extensive national and international collaboration with academia and industry all around the world. <http://www.chalmers.se/en/departments/cse/Pages/default.aspx>

At Chalmers University (www.chalmers.se/en) both Swedish and English are used in undergraduate courses. Half of our researchers and PhD students at the department come from more than 30 different countries.

"This is Gothenburg" video: <https://www.youtube.com/watch?v=QkCgd9YfZ34>