Dr. Francois Fouquet

Chief Technology Officer
DataThings Luxembourg
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Skills

Programming Languages
C/C++, Java, Go, Scala, TypeScript, JavaScript, Kotlin, Dart, HTML5...

Design principles
Model-driven Engineering, UML
Reactive & Stream Processing
Graph DB, MapReduce...

Machine Learning
NeuralNet*, RNN, LSTM
Gaussian Mixture Model,
SVM, Random forest,...

Middlewares
*ESB, *MQ (ActiveMQ, AMQP), Gossip*, Paxos*, Raft*, AJAX, WebSocket, WebRTC,...

Big Data & Storage
Hadoop, Spark, Cassendra, Neo4J, MongoDB, Redis, MySQL, Oracle, PostgresSQL,..

Languages
French: (Native)
English: (Fluent)
German: (Beginner)

Research project

Since my PhD, my research and development objectives are targeting the software engineering methods to build distributed, large-scale machine learning powered smart systems. As a framework designer, my solutions take place as backbone data layer to empower reasoning engines for next-gen Industry 4.0 and Smart Grid infrastructure. After years of research in the area, my role at DataThings is now focused on the construction of time-aware systems, leveraging innovative solutions to represent tightly temporal data and data from learning algorithms, ultimately to create a real-time simulation and operational decision tools. For various industries, I'm working to promote the use of machine learning in order create synergies between Big Data, forecasting systems and simulation mechanisms.

Professional Experience

Co-founder & Chief Technology Officer (CTO), DataThings (LU) January 2018 - Present

- DataThings has been created as a spin-off my research activities to transfer our progress in live data analytics for various industrial domains
- Industry 4.0, SmartGrid, Metal Industry (predictive maintenance)
- IoT & Cyber Phsical Systems (national monitoring)

Research Associate, SnT Luxembourg (LU) January 2013 - December 2017

- In collaboration with the Luxembourgish electricity provider CREOS, I'm working to create Intelligent Systems to detect suspicious values or potential grid overload
- SmartGrid security leveraging live and real-time reactive security
- Intelligent Systems and Big Data modeling
- IoT and near real-time analytics

PhD Student, IRISA/INRIA/University of Rennes 1 (FR) October 2009 - March 2013

- PhD topic: Kevoree Project a Model@Runtime approach to build and design continoulsy distributed, heterogenous and self adaptive systems from Internet of Things to Cloud infrastructures
- Keywords: Model Driven Engineering, Domain Specific Language, Component & Service architecture, Dynamic Self-adaptive Systems, Model@Runtime

Invited Researcher, SINTEF Oslo (NO) October 2011 - July 2012

- The goal of this visit was to create a software kernel to dynamically update the firmware of Internet of Things devices
- Keywords: IoT, Arduino, Embedded softare, Component & Service architecture, Dynamic Self-adaptive Systems, Model@Runtime

Capgemini France, Internship as a SOA Architect (FR) March 2009 - September 2009

- Developement of a reference architecture for high availibity ESB based systems
- On-field P2P (wifi + 3G) data management system for emergency services
- Message oriented middleware in dynamic and distributed environment
- A geolocalization system to collect, monitor and create alerts for fishing boats (french ministry of equipment)

Architect developer, Dimension IT (FR) June 2007 - September 2007

- Developement of a specific ERP kernel to manage authentification on cluster of distributed servers acting as experimental Wifi mesh network Internet Access Points

Developer, Consultant, PrydeGroup (FR) June 2006 - October 2009

- Business intelligent dashboard developement integrated into two ERP information system products: Oracle Application and TexasWin. Real-time and collaborative tools has been included into the module, compliance with mobile devices

Education Background

University of Rennes 1, PhD, Computer Science 2009 - 2013

- Coursework: Distributed Systems, Adaptive Systems, Meta-Modeling, Self-adaptation strategy, Genetic Algorithms, Data Mining

University of Rennes 1, Master, Computer Science 2007 - 2009

- Coursework: SOA, Large scale developements, Intelligent Algorithms, Software Engineering, Machine Organization

University of Rennes 1, Bachelor, Computer Science 2006 - 2007

- Coursework: Algorithms, Data Structures, Databases

University of La Rochelle, DUT, Computer Science 2004 - 2006

- Coursework: Software Engineering, Data modeling, Project management

Open Source

GreyCat
(Graph, ML, TimeSeries)
greycat.ai

Kevoree Platform
(Dynamic Components)
kevoree.org

Many World Graph DB
(Big Data, MOEA)
mwg.kevoree.org

Kermeta Language
(SLE, Compiler)
kermeta.org

ThingML Platform
(embedded devices)
thingml.org

Kevoree Modelling Framework
(MDE, Scalability)
www.kevoree.org/kmf

Polymer Framework
(Genetic algorithms)
kevoree.org/polymer

KCL
(JVM, ClassLoaders)
github.com/dukeboard/kevoree-classloading-framework

Talk
(Keynote, HTML5)
github.com/dukeboard/talk-app

Supervision participation activities

Donia EL KATEB *PhD Student* 2013 - 2015

- Balancing non-functional requirements in cloud-based software: An approach based on security-aware design and multi-objective software dynamic management
- Keywords: Cloud, Genetic Algorithms, Optimization, Reasoning Engine, Models@Run.time

Assaad MOAWAD *PhD Student* 2013 - 2016

- Towards Ambient Intelligent Applications using Models@run.time and Machine Learning for Context-Aweness
- Keywords: Models@Run.time, Time distortion, BigData, Live Machine Learning, Privacy

Thomas HARTMANN *PhD Student* 2013 - 2016

- Enabling Model-Driven Live Analytics for Cyber-Physical Systems: the case of Smart Grids
- Keywords: Models@Run.time, Time distortion, BigData, What-if analytics

Ludovic MOULINE *PhD Student* 2015 - Present

- What-If analytics for SmartHome using Models@Run.time
- Keywords: Models@Run.time, Live Machine Learning, IHM, IOT

Nikos Antoniadis *PhD Student* 2017 - Present

- Deep Search using Genetic Algorithm of What-If Analytics
- Keywords: MOEA, Machine Learning, Models@Run.time, CPS, Smart Grid

14 *Master Students*

- various topics connected by IoT, sensor networks and resulting live analytics techniques such as Graph and Stream processing.
- Keywords: Modelling, IoT, Smart Home, Big Data, Machine Learning, Stream analytics

Conferences and Journals program commitee participation

PC Member activities

- SmartGridComm: IEEE International Conference on Smart Grid Communications
- FiCloud: IEEE International Conference on Future Internet of Things and Cloud
- MODELSWARD: International Conference on Model-Driven Engineering and Software Development
- M4NG: Middleware for Next Generation Internet Computing workshop
- MOMO: International Modularity in Modelling Workshop
- Modularity: Poster session track of International Conference on Modularity

Reviewer activities

- MODELS: International Conference on Model Driven Engineering Languages and Systems
- JSS: Journal of Systems and Software
- SOSYM: International Journal on Software and Systems Modeling
- ICSE: International Conference on Software Engineering
- STVR: Software: Testing, Verification and Reliability Journal
- ICWS: International Conference on Web Services
- CODASPY: Conference on Data and Application Security and Privacy
- MRT: International Workshop on Models@run.time

Teaching activities

Advanced Techniques for Software Architecture Construction *(Master 2)* 2009 - 2012

- Keywords: Component, OSGi, SOA, GWT, ORM meppers, Aspect-oriented developement

Objet-based initial conception *(Master 2)* 2009 - 2012

- Keywords: design patterns, parallel computing, processes, threads, deadlocks, scalable code

Client/Server configurable architecture *(Master 2)* 2009 - 2012

- Keywords: SOA, Inversion of Control, Modular developement, Spring, ORM mappers, JPA/JDO

ESB and Urbanization of Information Systems *(Master 2)* 2009 - 2012

- Keywords: Enterprise Service Bus (ESB), Integration Patterns (EIP), Message Bus (AMQP/JMS), Apache Camel

Introduction to development language *(Bachelor 1)* 2009 - 2012

- Keywords: Algorithm, Complexity, Data structures, Java

Component-based architecture using Kevoree *(Master 2)* 2011 - 2012

- Keywords: Component-based conception, Distributed communication patterns, IoT, Hardware control, Home Automation

Architecture and Middleware *(Military Master 2)* 2010 - 2012

• Keywords: Distributed systems, Reliability, Decoupled Architecture, Message Bus, Transactional exchanges

System of Systems from SOA to ESB *(Master 2)* 2013 - 2015

• Keywords: ESB, EIA, SOA, MOM, Apache Camel, DSL design

Distributed Models at runtime *(Master 2)* 2015 - Present

• Keywords: Modeling tools, EMF, KMF, Message Bus, WebSockets, WebRTC, IoT

BigData and Model-driven Analytics *(Master 2)* 2015 - Present

• Keywords: Hadoop, Spark, Sensor, Machine Learning, Graph database

Performance Metrics

Impact *(from Google Scholar)*

• Best paper awards: 3
• Citations: 442
• H-index: 11
• i10-index: 12

Number of publications

• Journals *(with acts and peer reviewed)*: 3
• Conferences *(with acts and peer reviewed)*: 25
• Workshops *(with acts and peer reviewed)*: 6
• Others *(national conferences and white papers)*: 10

Selected publications

GreyCat: Efficient What-If Analytics for Data in Motion at Scale

• under review at Information System Journal *(2018)*
• Hartmann, T., Moawad, A., Fouquet, F., Rouvoy, R. & Le Traon, Y.

Enabling lock-free concurrent workers over temporal graphs composed of multiple time-series

• ACM Symposium on Applied Computing *(2018)*
• Fouquet, F., Hartmann, T., Mosser, S., Cordy, M.

Visualizing and Exploring Dynamic High-Dimensional Datasets with LION-tSNE

• under review at Transaction on Visualization and Computer Graphics Journal *(2018)*
• Boytsov, A., Fouquet, F., Hartmann, T., LeTraon, Y.

Enabling Temporal-Aware Contexts for Adaptative Distributed Systems

• Annual ACM Symposium on Applied Computing *(2018)*
• Mouline, L., Hartmann, T., Fouquet, F., Benelallam, A., Bourcier, J., Morin, B., Barais, O.

Leveraging Live Machine Learning and Deep Sleep to support a self-adaptive efficient configuration of periodic sensors

• under review *(2018)*
• Cecchinel, C., Fouquet, F., Mosser, S., Collet, P.

Analyzing Complex Data in Motion at Scale with Temporal Graphs

• International Conference on Software Engineering & Knowledge Engineering *(2017)*
• Hartmann, T., Fouquet, F., Jimenez, M., Rouvoy, R., Le Traon, Y.

Raising Time Awareness in Model-Driven Engineering

• International Conference on Model Driven Engineering Languages and Systems *(2017)*
• Benelallam, A., Hartmann, T., Mouline, L., Fouquet, F., Bourcier, J., Barais, O., Le Traon; Y.

The Next Evolution of MDE: A Seamless Integration of Machine Learning into Domain Modeling

• Software & Systems Modeling *(2017)*
• Hartmann, T., Moawad, A., Fouquet & Le Traon, Y.
• **Best paper award**

A New Modelling Framework Over Temporal Graphs for Collaborative Mobility Recommendation Systems

• Intelligent Transportation Systems Conference *(2017)*
• Toader, B., Moawad, A., Fouquet, F., Hartmann, T., Popescu M., Viti, F.

Near real-time electric load approximation in low voltage cables of smart grids with models@Run.time

• Annual ACM Symposium on Applied Computing *(2016)*
• Hartmann, T., Moawad, A., Fouquet, F., Reckinger, Y., Klein, J., & Le Traon, Y.

ScapeGoat: Spotting Abnormal Resource Usage in Component-based Reconfigurable Software Systems

- Journal of Systems and Software *(2016)*
- Gonzalez-H, I., Bourcier, J., Daubert, E., Rudametkin, W., Barais, O., Fouquet, F., Baudry, B.

Squirrel: architecture driven resource management

- Annual ACM Symposium on Applied Computing *(2016)*
- Gonzalez-H, I., Bourcier, J., Rudametkin, W., Barais, O., Fouquet, F.

KevoreeJS: Enabling dynamic software reconfigurations in the Browser

- International ACM SIGSOFT Symposium on Component-Based Software Engineering *(2016)*
- Tricoire, M., Barais, O., Leduc, M., Fouquet, F., Sunyé, G.

Suspicious Electric Consumption Detection Based on Multi-Profiling Using Live Machine Learning

- International Conference on Smart Grid Communications *(2015)*
- Hartmann, T., Moawad, A., Fouquet, F., Reckinger, Y., Mouelhi, T., Klein, J., & Le Traon, Y.

Beyond Discrete Modeling: Continuous and Efficient Models@Run.time for IoT

- International Conference on Model Driven Engineering Languages and Systems *(2015)*
- Moawad, A., Hartmann, T., Fouquet, F., Nain, G., Klein, J., & Le Traon, Y.

Stream my Models: Reactive Peer-to-Peer Distributed Models@run.time

- International Conference on Model Driven Engineering Languages and Systems *(2015)*
- Hartmann, T., Moawad, A., Fouquet, F., Nain, G., Klein, J., & Le Traon, Y.

Mashup of metalanguages and its implementation in the kermeta language

- Software & Systems Modeling *(2015)*
- Jézéquel, J. M., Combemale, B., Barais, O., Monperrus, M., & Fouquet, F.

Polymer: A Model-Driven Approach for Simpler, Safer, and Evolutive Multi-Objective Optimization Development

- International Conference on Model-Driven Engineering and Software Development *(2015)*
- Moawad, A., Hartmann, T., Fouquet, F., Nain, G., Klein, J., & Bourcier, J.

Model-based time-distorted Contexts for efficient temporal Reasoning

- International Conference on Software Engineering and Knowledge Engineering *(2014)*
- Hartmann, T., Fouquet, F., Nain, G., Brice, M., Klein, J., & Le Traon, Y.
- **Best paper award**

A Native Versioning Concept to Support Historized Models at Runtime

- International Conference on Model Driven Engineering Languages and Systems *(2014)*
- Hartmann, T., Fouquet, F., Nain, G., Morin, B., Klein, J., Barais, O., & Le Traon, Y.

Generating realistic Smart Grid communication topologies based on real-data

- International Conference on Smart Grid Communications *(2014)*
- Hartmann, T., Fouquet, F., Klein, J., Le Traon, Y., Pelov, A., Toutain, L., & Ropitault, T.

Generic cloud platform multi-objective optimization leveraging models@run.time

- Symposium On Applied Computing *(2014)*
- El Kateb, D., Fouquet, F., Nain, G., Meira, J. A., Ackerman, M., & Le Traon, Y.

An eclipse modelling framework alternative to meet the models@ runtime requirements

- International Conference on Model Driven Engineering Languages and Systems *(2012)*
- Fouquet, F., Nain, G., Morin, B., Daubert, E., Barais, O., Plouzeau, N., & Jézéquel, J. M.

A dynamic component model for cyber physical systems

- Symposium on Component Based Software Engineering *(2012)*
- Fouquet, F., Morin, B., Fleurey, F., Barais, O., Plouzeau, N., & Jezequel, J. M.