Stage M2
Probabilistic diagnosability for asynchronous discrete event systems

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Model-based diagnosis analyzes the possible evolutions of a partially observable system, in order to determine whether or not a given invisible fault event has occured. In [1, 5], an extension of the classical discrete-event approach to fault diagnosis has been proposed; it accounts for concurrency in the behaviour of the system, described by a partial order semantics. The internship candidate will

- develop efficient methods for probabilistic fault diagnosis in the non-sequential Petri net models from [2–4], using timed or untimed approaches,
- study probabilistic diagnosability of asynchronous systems (by evaluation of likelihood false positive/false negative diagnoses) in this setting, and
- develop algorithms for the above tasks.

References

[1] Eric Fabre, Albert Benveniste, Claude Jard, and Stefan Haar. Distributed monitoring of concurrent and asynchronous systems. *Discrete Event Dynamic Systems: theory and application* 15(1):33–84, March 2005.

[2] Albert Benveniste, Eric Fabre, and Stefan Haar. Markov Nets: Probabilistic Models for distributed and concurrent systems. *IEEE Transactions on Automatic Control* 48(11):1936-1950, November 2003.

[3] Stefan Haar. Probabilistic Cluster Unfoldings. *Fundamenta Informaticae* 53(3-4):281-314, Dec. 2002.

[4] S. Abbes and A. Benveniste. True-concurrency Probabilistic Models: Branching cells and Distributed Probabilities for Event Structures. *Information and Computation*, 204 (2), 231-274 . Feb 2006.

[5] Albert Benveniste, Eric Fabre, Stefan Haar, Claude Jard. Diagnosis of Asynchronous Discrete Event Systems, a Net Unfolding Approach. IEEE Trans. on Automatic Control, 48(5), 714-727, May 2003

[6] David Thorsley and Demosthenis Teneketzis. Diagnosability of Stochastic Discrete-Event Systems. *IEEE Transactions on Automatic Control* 50, No. 4, April 2005, pp 476–492