1. Formal methods in the traditional AI planning but with quantitative time constraints.

The aim is to develop an efficient and comprehensive logical tool for a typical AI problem of making a plan of the actions to be performed by a robot so that it could get into a final situation, if it started with a certain initial situation.

A particular focus is on planning under uncertainty caused by actions with non-deterministic effects and actions that may have quantitatively delayed effects in continuous time.

The ultimate goal is to show that for many planning problems - that are known to be a considerable obstruction to computer-aided planners, our systems lead to a dramatic contraction of the search space from exponential to polynomial in size.
1. Formal methods in the traditional AI planning but with quantitative time constraints.

2. Formal verification of software. Effective logical formalisms for resource- and memory-sensitive reasoning

The aim is to develop efficient and comprehensive logical systems and programming tools capable of handling important properties of real-time dynamic systems such as safety, liveness, schedulability, surviveness, simulation, monitoring, etc.

As an effective language for reasoning about heap memory models, we use the formalism of Hoare triples based on separation logic.

Besides the intrinsic technical/theoretical interest of its principles, such as the frame rule and abduction, local reasoning and compositionality, separation logic provides new insights which could be of use in practical applications of logic to program analysis.
2. Formal verification of software. Effective logical formalisms for resource- and memory-sensitive reasoning


3. Formal systems for assured information sharing within collaborative systems and security protocols with quantitative time constraints.

The aim is to develop efficient and comprehensive logical systems and programming tools to enable multiple parties to share information and at the same time enforce confidentiality, privacy, trust, release, dissemination, data quality and provenance policies.

The formal systems should be capable of handling important properties of real-time collaborative systems such as safety, liveness, schedulability, surviveness, simulation, monitoring, etc.

The aim is to develop efficient logical systems capable of handling security protocols in software, distributed systems, and concurrent systems.
3. Formal systems for assured information sharing within collaborative systems and security protocols with quantitative time constraints.

4. Formal systems in computational linguistics.

The aim of this research is to develop comprehensive and efficient logical formalisms capable of handling syntactical and semantical properties of a natural language.

5. Model Checking.

In particular, the aim is to develop efficient and comprehensive logical systems and programming tools for the systems with user-defined inductive predicates (such as lists, trees, etc.) as used in program verification.

et cetera, et cetera