LOGIC, PROGRAMMING AND CONSTRUCTIVE MATHEMATICS

ANDERS MÖRTBERG

My research is in the intersection of logic, programming and constructive mathematics. Specific topics that interest me, with some keywords in parantheses, are:

- logic (dependent type theory, proof automation, proof verification, proof assistants),
- computer formalization of mathematics and computer science (using proof assistants such as Agda, Coq, Lean),
- homotopy type theory (HoTT, univalent foundations, higher inductive types, cubical type theory, Cubical Agda, synthetic homotopy theory),
- constructive mathematics (commutative algebra, computer algebra, algebraic geometry and topology),
- category theory (semantics of type theories, higher category theory), and
- functional programming (connections to category theory and logic, implementation of proof assistants),

Interest in one or more of the above topics can be a starting point for a possible PhD thesis topic. My webpage contains recent papers and other relevant information about my research: https://staff.math.su.se/anders.mortberg/

Some more specific potential thesis topics with me are:

- Formalize mathematics and computer science in a proof assistant based on type theory, e.g. in Cubical Agda. Possible topics to formalize include synthetic homotopy theory, synthetic algebraic geometry, algebra or data structures using the structure identity principle of HoTT, higher category theory, etc.
- Develop new type theories and study their properties. This includes both implementation and proving meta-theoretic properties (canonicity, normalization, etc.) as well as general model theoretic considerations.
- Develop models of type theory in higher categories and/or using methods from categorical logic.

Feel free to contact me on anders.mortberg@math.su.se if you want to discuss some potential topics or have any questions when preparing your application.