

Teaching Foundations of Computation and Deduction Through Literate Functional Programming and Type Theory Formalization

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Abstract

We describe experiments in teaching fundamental informatics notions around mathematical structures for formal concepts, and effective algorithms to manipulate them. The major themes of lambda-calculus and type theory served as guides for the effective implementation of functional programming languages and higher-order proof assistants, appropriate for reflecting the theoretical material into effective tools to represent constructively the concepts and formally certify the proofs of their properties. Progressively, a literate programming and proving style replaced informal mathematics in the presentation of the material as executable course notes. The talk will evoke the various stages of (in)completion of the corresponding set of notes along the years (see [1, 2, 14, 5, 6, 10, 12, 16, 7, 15, 17, 9, 3, 13, 11, 4, 8]), and tell how their elaboration proved to be essential to the discovery of fundamental results.

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