Minh Nguyen

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Education

PhD, Computer Science, University of Bristol (Ongoing) **2020-24**
Supervisors: Meng Wang, Roly Perera

MEng, Computer Science, First Class Honours, University of Bristol **2015-19**
2018-19 - 1st Class, (71)
2017-18 - 1st Class, (76)
2016-17 - 1st Class, (80)
2015-16 - 1st Class, (76)

Research Interests

My current research investigates the formalisation and implementation of algebraic effects, extensible data, and row polymorphism in embedded probabilistic programming languages. The intention is to encode probabilistic models as first-class citizens (hence being modular and composable) whilst being simultaneously general-purpose (i.e. suitable for all forms of simulation and inference). Related to this is the exploration of how complex inference algorithms can be modularly implemented using effect handlers to perform composable program transformations on models. My other interests include functional programming (in particular, Haskell), type-level programming, type theory, embedded domain-specific languages (eDSLs), and recursion schemes.

Skills

Languages
Haskell
Scala, *Idris*, *C*, *C++*, *C#*, *Javascript* (Previous experience)

Technologies
I have thorough experience with a vast amount of web development frameworks and APIs. I also have experience in using data-science and machine learning libraries, concurrent and parallel multi-processing technologies, graphics engines, and language parsing libraries.

Projects

"Linked Visualisations via Galois Dependencies" **Jan, 2022**
POPL '22
R.Perera, M.Nguyen, T.Petricek, M.Wang
This presents new language-based data provenance techniques for linking visualisations and other structured outputs to data in a fine-grained way, allowing a user to interactively explore how data attributes map to visual or other output elements by selecting (focusing on) substructures of interest. This builds on bidirectional program slicing techiques based on Galois connections.

"Composable, Modular Probabilistic Models" **Aug, 2021**
ICFP '21, ACM Student Research Competition
M.Nguyen, R.Perera, M.Wang
This presents an effect-oriented embedded DSL in Haskell for modularly defining probabilistic models as first class citizens which can be reused for both simulation and inference. It is then demonstrated how simulation and inference can be expressed naturally as composable program transformations using algebraic effect handlers.

"Folding over Neural Networks" **Jul, 2019**
Masters Dissertation
M.Nguyen, N.Wu
This presents novel research and implementation in Haskell, demonstrating that neural network training can be encoded as a recursion scheme system, specifically, a common property of being

able to model forward and back propagation as compositions of catamorphisms (folds) and anamorphisms (unfolds). This is shown across a range of complex network types: fully-connected networks, convolutional networks, and deep LSTM networks.

Talks

"Composable, Modular Probabilistic Models" — **Sep, 2021**
IFL '21

Teaching

Dissertation Supervisor — **2020-21**
Main supervisor for a 4th year student on their masters dissertation, entitled "Deep Learning Architectures as Pure Functions". — University of Bristol

Advanced Topics in Programming Languages (COMSM0066) — **2020-21**
Language Engineering (COMS22201) — University of Bristol
Development of lab worksheets and implementation of toy interpreters and compilers in Haskell, covering topics such as type checking, polymorphic types. and type inference.

PL Seminar Speaker — **2019-21**
I occasionally give talks/seminars about Haskell, functional programming, or my own research, to the Programming Languages Research Group and undergraduates. — University of Bristol

Functional Programming (COMS10016) — **2017, 2019-20**
Teaching assistant for the first year functional programming unit. Attending weekly two-hour lab sessions to mentor students in beginner-to-intermediate concepts and approaches to problem-solving in Haskell and functional programming. Marking exams. — University of Bristol

Awards

ICFP '21, ACM Student Research Competition, 1st Place — **Aug, 2021**
This corresponds to one of my PhD projects, entitled "Composable, Modular Probabilistic Models". — ICFP '21

Bloomberg Award - Best Machine Learning Project — **Jul, 2019**
This corresponds to my masters dissertation entitled "Folding over Neural Networks". — University of Bristol

Graphcore Award - Best Group Project — **Jul, 2018**
This comprised the development of a VR Horror Game, in which I was responsible for programming the player mechanics and enemy AI, and the game interaction/event system. This used C#, Unity, Oculus Rift and Touch, and a Bluetooth Heart Rate Monitor. — University of Bristol

Netcraft Award - Top Ten Achieving CS Students — **Jul, 2017**
University of Bristol