

# Kwing Hei Li

hei411.github.io

Third-year PhD student specializing in *formal verification* of security-related infrastructure.

## EDUCATION

• <b>Aarhus University</b>	Aarhus, Denmark
<i>Ph.D. in Computer Science (in progress)</i>	2023 – 2027
• <b>University of Cambridge</b>	Cambridge, UK
<i>M.Phil in Advanced Computer Science, Pass with Distinction</i>	2022 – 2023
• <b>University of Cambridge</b>	Cambridge, UK
<i>B.A. Hons. in Computer Science with Mathematics, 1st class</i>	2019 – 2022

## PUBLICATIONS

• Modular Reasoning about Error Bounds for Concurrent Probabilistic Programs	ICFP 2025
• Approximate Relational Reasoning for Higher-Order Probabilistic Programs	POPL 2025
• Tachis: Higher-Order Separation Logic with Credits for Expected Costs	OOPSLA 2024
• Error Credits: Resourceful Reasoning about Error Bounds for Higher-Order Probabilistic Programs	ICFP 2024
Distinguished Paper Award	
• Secure Aggregation for Federated Learning in Flower	DistributedML 2021

## EXPERIENCE

• Separation Logics for Probability, Concurrency, and Security	Aarhus, Denmark
Supervised by Lars Birkedal	2023 – 2027
◦ Develop higher-order <i>separation logic</i> for reasoning about <i>concurrent probabilistic</i> programs	
◦ Logics implemented in the separation logic framework Iris and the proof assistant Rocq	
◦ Verified various complex algorithms and data structures, e.g. Merkle trees, Bloom filter, rejection sampling schemes	
• Wait-Free Task Solvability of Asynchronous Distributed Models	Cambridge, UK
Supervised by Marcelo Fiore	2022 – 2023
◦ Developed a unified mathematical framework for reasoning about two incompatible distributed models	
◦ Proved a new result that shows that the two models are equivalent in task solvability	
◦ Masters thesis [pdf]	
• Multi-Language Program Verification for Closures	Saarbrücken, Germany
Supervised by Michael Sammler and Derek Dreyer	2022
◦ Internship on extending DimSum, a decentralized approach to multi-language semantics and verification	
◦ Extended DimSum to reason about modules written in a functional language that supports closures	
• Type Systems for Functional Reactive Programming	Cambridge, UK
Supervised by Alan Mycroft	2021 – 2022
◦ Designed a functional reactive programming language Eva, inspired by the Lively RaTT calculus	
◦ Type-checked Eva programs has strong guarantees, e.g. non-space-leaking and generativity	
◦ Bachelor thesis [pdf]	
• Secure Aggregation for Federated Learning in Flower	Cambridge, UK
Supervised by Pedro Porto Buarque de Gusmao and Nicholas Lane	2021
◦ Extended the federated machine-learning framework Flower to support secure aggregation protocols	
◦ Implemented the SecAgg(+) protocols with a flexible API	

## SKILLS

**Software:** Rocq, Iris, Haskell, C++, Java, OCaml, Python, Eva

**Languages:** English (fluent), Cantonese (fluent), Mandarin (conversational)

**Interests:** Automated Reasoning, concurrency, distributed systems, formal methods, formal verification, probability, program logics, security, type system