## MA4198 PROJECT PROPOSAL (PROJECT CUM SEMINAR GROUP)

### SUPERVISOR'S INFO

| | |
|---|---|
| **Name:** | Zhang Lei |
| **Email:** | matzhlei@nus.edu.sg |
| **Tel number:** | 65162747 |
| **Office location:** | S17-06-05 |

### PROJECT ID: PS2420-08

### TITLE

| |
|---|
| Formalization and LEAN |

### BRIEF DESCRIPTION OF PROJECT

Proof assistants are specialized software tools that verify the correctness of proofs by ensuring they adhere strictly to logical foundations. Among these, Lean 4, chiefly developed by Leonardo de Moura, has garnered significant attention in the mathematical community for its robust architecture and capabilities. Unlike computational software such as MATLAB, Lean 4 is a proof assistant software that checks the proofs are correct down to their logical foundation. For example, while MATLAB can compute the derivative of a particular function, Lean 4 can check the correctness of a given proof of continuity. The language has attracted a lot attentions from the mathematical society in recent years. Especially, LEAN has a great potential to resolve the mathematical reasoning in Large Language Model and then realize the automating proof.

This project aims to formalize some results in Analysis using Lean 4. This project shall focus on the programming aspect. We first focus on the textbook "Mathematics in Lean" learning the proof assistant Lean 4. Then we shall review some basic results on Analysis. Finally, we aim to formalize the results in Lean 4.

### EXPECTATION/S

| |
|---|
| This project has a significant component on programming using Lean 4. Students are expected to formalize some results related with Analysis. They could be small lemmas, or some non-trivial theorem as a combined team work. |

### PREREQUISITE/S (at level 3000 or below, with at most one course at level 3000)

| |
|---|
| MA 2108 Analysis I, MA 3210 Analysis II |

### READING REFERENCE/S

| |
|---|
| Mathematics in Lean by Jeremy Avigad and Patrick Massot |