

Logic - Theorem Formalization With a Proof Assistant

CSE 496 - Second Presentation

Fatih Doğan

27.12.2023

Project Advisor: Dr. Tülay Ayyıldız Akoğlu

Contents

- ▶ Definition of Project
- ▶ About LEAN
- ▶ Success Criteria
- ▶ Project Time Line

Definiton of Project

Lean is a proof assistant that helps you manipulate the computer to check if the logic you follow make sense.

So in this project I will be using LEAN software and formalize a theorem that has not yet been formalized.

LEAN Example

```
example (f : Nat → Nat) (k : Nat) (h1 : f 0 = 0) (h2 : k = 0) : f k = 0 := by
  -- f is a function that takes a natural number and returns a natural number
  -- f(0) = 0
  -- prove that f(k) = 0
  rewrite [h2]
  rewrite [h1]
  rfl
```

▼ Tactic state

1 goal

f : Nat → Nat

k : Nat

h1 : f 0 = 0

h2 : k = 0

⊢ f 0 = 0

▼ Tactic state

1 goal

f : Nat → Nat

k : Nat

h1 : f 0 = 0

h2 : k = 0

⊢ 0 = 0

Success Criteria

- ▶ Discrete Math, Logic, Proof Methods Knowledge
- ▶ Learning LEAN Software
- ▶ Formalize a theorem with the help of LEAN Proof Assistant.

Project Time Line

