Software System Design and Implementation

https://powcoder.com

Add Wei Curtis Millar Powcoder

- Classical logic is the logic that most people know about.
- Intuitionistic legic does not contain the axion of excluded middle  $p \vee \neg p$  or equivalently  $p \vee p$ .
- In classical logic more can be proven but less can be expressed.
- Intuitionistic proof of an existence statement gives a witness for the statement. Add Vechat powcoder

00000

## Assignment Project Exam Help Let Q be the set of rational numbers and I be the set of irrational numbers.

- Consider the statement  $\exists x, y.(x \in \mathbb{I}) \land (y \in \mathbb{I}) \land (x^y \in \mathbb{Q})$ .
- Proof:
  - Consident to Ser / 2 p. owcoder.com

  - o Other Add We Chat powcoder

- ullet Let  ${\mathbb Q}$  be the set of rational numbers and  ${\mathbb I}$  be the set of irrational numbers.
- Consider the statement  $\exists x, y. (x \in \mathbb{I}) \land (y \in \mathbb{I}) \land (x^y \in \mathbb{Q})$ .
- Proof:
  - Considertips://2powcoder.com
  - - Pick  $x = \sqrt{2}$  and  $y = \sqrt{2}$
    - otherwise if the Chat powcoder
      - •
      - •

- ullet Let  ${\mathbb Q}$  be the set of rational numbers and  ${\mathbb I}$  be the set of irrational numbers.
- Consider the statement  $\exists x, y.(x \in \mathbb{I}) \land (y \in \mathbb{I}) \land (x^y \in \mathbb{Q})$ .
- Proof:
  - Considertions: 1/2 powcoder.com
  - - Pick  $x = \sqrt{2}$  and  $y = \sqrt{2}$
    - otherwise in 12 We Chat powcoder
      - Pick  $x = \sqrt{2}^{\sqrt{2}}$  and  $y = \sqrt{2}$
      - Then  $x^y = (\sqrt{2}^{\sqrt{2}})^{\sqrt{2}} = \sqrt{2}^2 = 2 \text{ so } x^y \in \mathbb{Q}$

#### Recall: The Curry-Howard Isomorphism

This correspondence goes by many names, but is usually attributed to Haskell Curry and William Howard ment Project Exam Help

	Logic	Programming	
1 44	Propositions	Types	
http	S://POWC	O Charles O	m
	S://poblification	Evaluation	

It turns out, no matter what logic you want to define, there is always a corresponding  $\lambda$ -calculus, and  $\Lambda$ cevers.

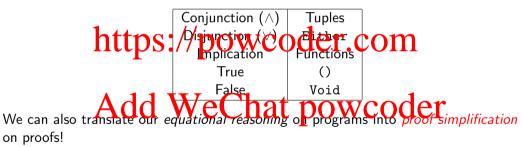
Constructive Logic
Classical Logic
Modal Logic
Linear Logic
Separation Logic

Continuations
Monads
Linear Types, Session Types
Region Types

on proofs!

#### **Translating**

### Assignment Project Exam Help We can translate logical connectives to types and back:



#### **Constructors and Eliminators for Sums**

### Assignment Project Exam Help

https://epoweoder.com



#### **Type Correctness**

### Assignment Project Exam Help

 $\frac{\Gamma \vdash e :: A}{\Gamma \vdash () :: ()} \stackrel{\Gamma \vdash e :: A}{\leftarrow \Gamma \vdash \text{Left } e :: \text{Either } A B} S_L \qquad \frac{\Gamma \vdash e :: B}{\Gamma \vdash \text{Right } e :: \text{Either } A B} S_R$   $\frac{\Gamma \vdash e :: A}{\Gamma \vdash \text{Right } e :: \text{Either } A B} S_R$ 



#### **Type Correctness**

### Assignment Project Exam Help

 $\frac{\Gamma \vdash e :: A}{\Gamma \vdash () :: ()} \stackrel{\Gamma \vdash e :: A}{\leftarrow \Gamma \vdash \text{Left } e :: \text{Either } A B} S_L \qquad \frac{\Gamma \vdash e :: B}{\Gamma \vdash \text{Right } e :: \text{Either } A B} S_R$   $\frac{1}{\Gamma \vdash \text{Right } e :: \text{Either } A B} S_R$ 



### **Examples**

```
prop_or_false :: a -> (Either a Void)
PropArsfsignment Project Exam Help
prop_or_true :: a -> (Either a ())
prop_or_true a = Right ()
https://powcoder.com
prop_and_true a = (a, ())
prop_double_Addo WeChatipowcoder
prop_double_neg_intro a f = f a
prop_triple_neg_elim ::
  (((a-> Void) -> Void) -> Void) -> a -> Void
prop_triple_neg_elim f a = f (\g -> g a)
```

#### Wrap-up

- Assignment Project Exam Help
- 2 There is a quiz for this week, but no exercise.
- Next week's lectures consist of an extension on dependent type systems and a revision lecture by Svedneson WCOder.com
- There will be a survey on Plazza for revision topics, comment on the poll with specific questions
- If you enjoyed the course and want to domore in this direction, ask us for thesis topics, taste of research projects, and consider attending COMP 3161 and COMP 4161.
- Fill in the myExperience reports, it is important for us to receive your feedback.

#### **Consultations**

- Consultations will be made on request. Ask on piazza or email cs3141@cse.unsw.edu.au.
- If there is he is number for Hopper.
- Will be in the Thursday lecture slot, 9am to 11am on Blackboard Collaborate.
- Make sure the divide of Homes Be pady to here you recreen with REPL (ghci or stack repl) and editor set up.