Meet our Teaching Assistant: Wonbin Kim

Education:

SUNY Korea (Stony Brook), CS Major

Experiences:

- United Nations 6th SDG Youth Summer Camp Summer 2022
- Biology 201 TA Spring 2022
- JoongDaily journalism internship Winter 2021/2022
- Global Leaders Youth Forum 2022 mentor Summer 2022
- Rovigos (Artifical intelligence start-up) research and marketing intern Summer 2022
- Member of We are Here (Volunteering club)
- Treasurer for SKCS (SUNY Korea Computing Society)
- Residence Assistant for the 16th floor of dorm B

JOIN OUR CLUB: SUNY KOREA COMPUTING SOCIETY

❖ Great way of networking with ambitious people who plan to get into the tech industry

❖ Practice leetcodes problems with us

❖ Help us organize future Hackathons

❖ Great way to make friends (MT, Dinner, etc)

❖ Build personal projects with us

❖ Long history and heritage

❖ We collaborate with the SBU computing society at the New York Campus

❖ Application Form:
https://forms.gle/LVE3tA6Cg4KppUNW9

Contact Details and Office Hours

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- Office Hours: Monday-Thursday 10 pm – 12 am at _____

CSE215: Lecture 05
Foundations of Computer Science

Instructor: Zhoulai Fu

State University of New York, Korea

March 3, 2022

Today's Objectives

- A comprehensive coverage of related SBU exam problems in 2020 & 2021

2021 Final

Problem 1. [5 points]
Construct a truth table for the following statement form: $p \wedge (q \vee r) \leftrightarrow p \wedge (q \wedge r)$.

p	q	r	p AND (q OR r)	p AND (q AND r)	p AND (q OR r) <==> p AND (q AND r)
T	T	T	T	T	T
T	T	F	T	T	T
T	F	F	F	F	T
T	F	T	T	F	F
F	T	T	F	F	T
F	T	F	F	F	T
F	F	F	F	F	T
F	F	T	F	F	T

2021 Final

Construct a truth table for the following statement form: $(p \rightarrow q) \vee ((q \oplus r) \rightarrow \sim p)$.

p	q	r	p->q	q xor r	(q xor r) -> ~p	(p -> q) \/ ((q xor r) -> ~p)
t	t	t	t	f	t	t
t	t	f	t			t
t	f	t	f	t	f	f
t	f	f	f	f	t	t
f	t	t	t			t
f	t	f	t			t
f	f	t	t			t
f	f	f	t			t

2021 Final

Verify using truth tables if the following two logical expressions are equivalent.
$(p \to q) \land (\sim p \to \sim q)$ and $\sim p \leftrightarrow \sim q$

```
| p | q | p->q | ~p -> ~q | (p->q) /\ (~p ->~q) | ~p <-> ~q |
|---+---+------+----------+---------------------+-----------|
| t | t | t    | t        | t                   | t         |
| t | f | f    | t        | f                   | f         |
| f | t | t    | f        | f                   | f         |
| f | f | t    | t        | t                   | t         |
```

2020 Final-a

Determine if the following deduction rule is valid.

$$p \rightarrow (q \lor r)$$
$$\sim (p \rightarrow q)$$
$$\therefore r$$

```
| p, q, r | p -> (q \/ r) | ~ (p -> q) | r |
|---------+---------------+------------+---|
| t t t   | t             | f          | t |
| t t f   | t             | f          | f |
| t f t   | t             | t          | t |
| t f f   | f             | t          | f |
| f t t   | t             | f          | t |
| f t f   | t             | f          | f |
| f f t   | t             | f          | t |
| f f f   | t             | f          | f |
```

So, it is valid — the critical row being Row #3
where premises are true and conclusion is true

2020 final-b

Problem 2. [5 points]

Is conditional operator $\rightarrow$ an associative operator? That is, is $(p \rightarrow q) \rightarrow r$ logically equivalent to $p \rightarrow (q \rightarrow r)$? Prove your answer.

```
| p, q, r | (p -> q) -> r | p -> (q -> r) |
|---------+---------------+---------------|
| t t t   | t             | t             |
| t t f   | f             | f             |
| t f t   | t             | t             |
| t f f   | t             | t             |
| f t t   | t             | t             |
| f t f   | f             | t             |
| f f t   | t             | t             |
| f f f   | f             | t             |
```

So, the two are not equivalent, considering
the rows with p,q,r being f, t, f or f, f, f

Alternative solution with logical equivalence

Problem 2. [5 points]

Is conditional operator $\rightarrow$ an associative operator? That is, is $(p \rightarrow q) \rightarrow r$ logically equivalent to $p \rightarrow (q \rightarrow r)$? Prove your answer.

- (p->q)->r = (~p∨q)->r = ~(~p∨q)∨r = (p ∧~q)∨r

- p ->(q ->r) = ~p∨(q->r) = ~p∨(~q∨r)=(~p∨~q)∨r

- To show the two differ, consider r=false, ~q=false, p = false

2020-final-b

Problem 3. **[5 points]**

Verify using truth tables if the following two logical expressions are equivalent.

$\sim p \leftrightarrow \sim q$ and $\sim (p \oplus q)$

```
| p | q | ~p <-> ~q | ~(p xor q) |
|---+---+-----------+------------|
| t | t | t         | t          |
| t | f | f         | f          |
| f | t | f         | f          |
| f | f | t         | t          |
```

Thus, the two are equivalent.

Summary

- Check validity and equivalence using truth tables

Thank you for your attention!