COSC 522

Machine Learning

Sai Swaminathan

Instructor

Sai Swaminathan (greek letter Ψ)

Preferred Pronouns: He, him and his

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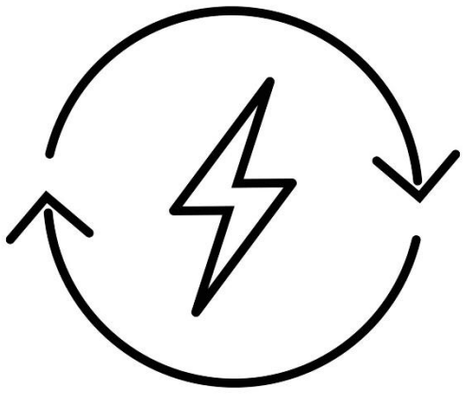
Office Hours: By Appointment, Monday: 4 PM to 5 PM

You can address me Prof. Sai or Dr. Sai, either is fine.

EPIC LAB



Energy

Printed Infrastructure

Interactive Computing

Teaching Team

Fabian Fallas-Moya (ffallasm@utk.edu)

Prof. Rhema Linder (Online Students)

rlinder@utk.edu

Course Prerequisites

- **Reasonable** programming experience
- Python experience preferred
- Exercises are probably possible in other languages but less help from TA's and Instructor

Course Website

Canvas Page

Machine Learning through the lens of sensors (data)

Learning Objectives

or how is it different from all other machine learning courses at UTK?

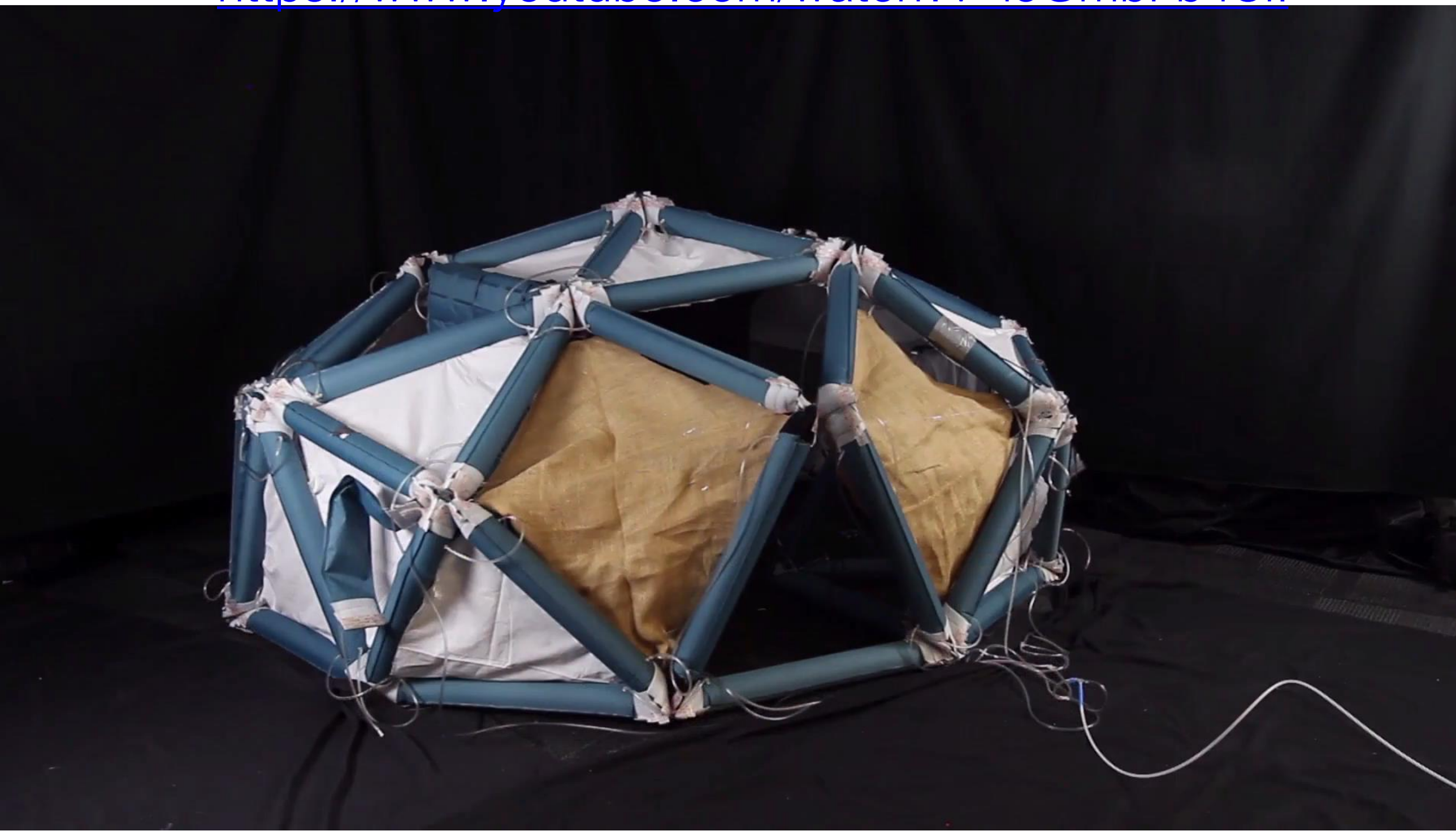
- We will not develop new machine learning algorithms
- We will not even implement all the existing machine learning algorithms
- Very little deep learning
- We will not “develop” new sensors

Application #1: Interactive Wall

https://www.youtube.com/watch?v=fMrbOASsiY8

Application #2: Human-Responsive Smart Structures

https://www.youtube.com/watch?v=ioGmbFb4SfI



Application #3: Interactive Gesture Recognition

https://www.youtube.com/watch?v=Tm2IuVfNEGk

Application #4: IoT Activity Recognition

https://www.youtube.com/watch?v=aqbKrrru2co

Learning Objectives

- Introduction to well-established machine learning algorithms
- Their relative strengths and weaknesses
- Introduction to sensing approaches
- New capabilities unlocked by combining sensing and machine learning
- Example driven
- Teach good practices

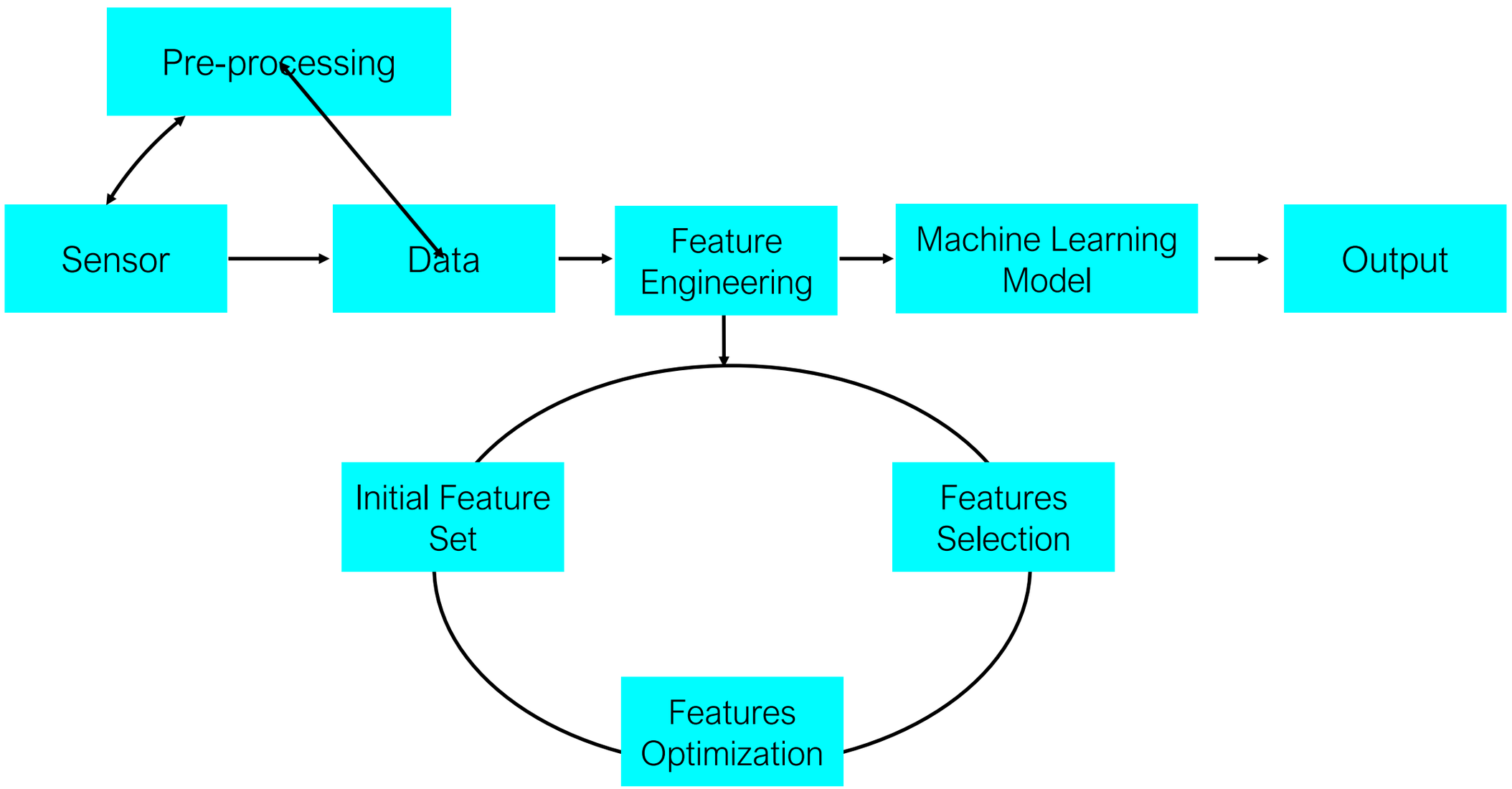
Lectures will be a combination of

- Discussions
- Tutorials
- Demos

Topics to be covered

- Jupyter notebook
- Data collection
- Feature Engineering
- Common Machine Learning Algorithms
- Scikit-learn (and perhaps Weka)
- Data Visualization
- Feature Selection
- Classification *vs.* Regression
- Cross-validation approaches
- Deep Learning (brief intro)
- Microphones
- Cameras
- Motion Sensors
- Ranging Techniques

ML Pipeline covered



Readings

- Will be posted after lecture, counts towards participation grade
- Encouraged to read **after** the lecture
- Post reflections on Canvas
- **Most importantly,** treat it as an example for your assignments and final project

Assignments

- 3 assignments (mini projects)
- Each aims at introducing some new skills or a new sensor
- Done individually
- But help each other (in person and on the Discord)

Late Days

- Maximum of 5 calendar days
- Lose 10% grade per day afterwards
- No late days for final project

Resources

- Smartphones
- Discord (Demo)
- Prototyping support

Evaluation of Assignments

- Jupyter notebook/Potentially Colab
- Videos and demos (for last 2 assignments)
- Stretch Goals

Grade Distribution

- Final project: 30%
- Assignments: 60% (20% for each assignment)
- Class Participation (Readings + Lecture-Quiz + Discussion): 10%

COSC522 Online vs. In-person

Online class only for MSCS program students.

No exchange possible due to UT fee structure.

Projects

- ~6 weeks
- Teams of 2 (sometimes 3)
- Teams formed by us (with your inputs)
- Best project ideas will come from you
- Contribution is peer-reviewed
- Videos
- Demos

Example Project
(very broadly)

- Activity recognition
- Recognizing exercises
- Tracking groceries in a household
- Recognizing MakerSpace activities
- Occupancy patterns
- Smart Agriculture
- Tracking buses in a city
- Predicting Seizures
- Monitoring food intake

Assignment 0

- Tell us more about yourself!
- Take the Survey (Counts as 5 points, participation)
    - URL Posted on Canvas
- Due at 9AM on 29th August 2022
- Course Syllabus can be found on Canvas

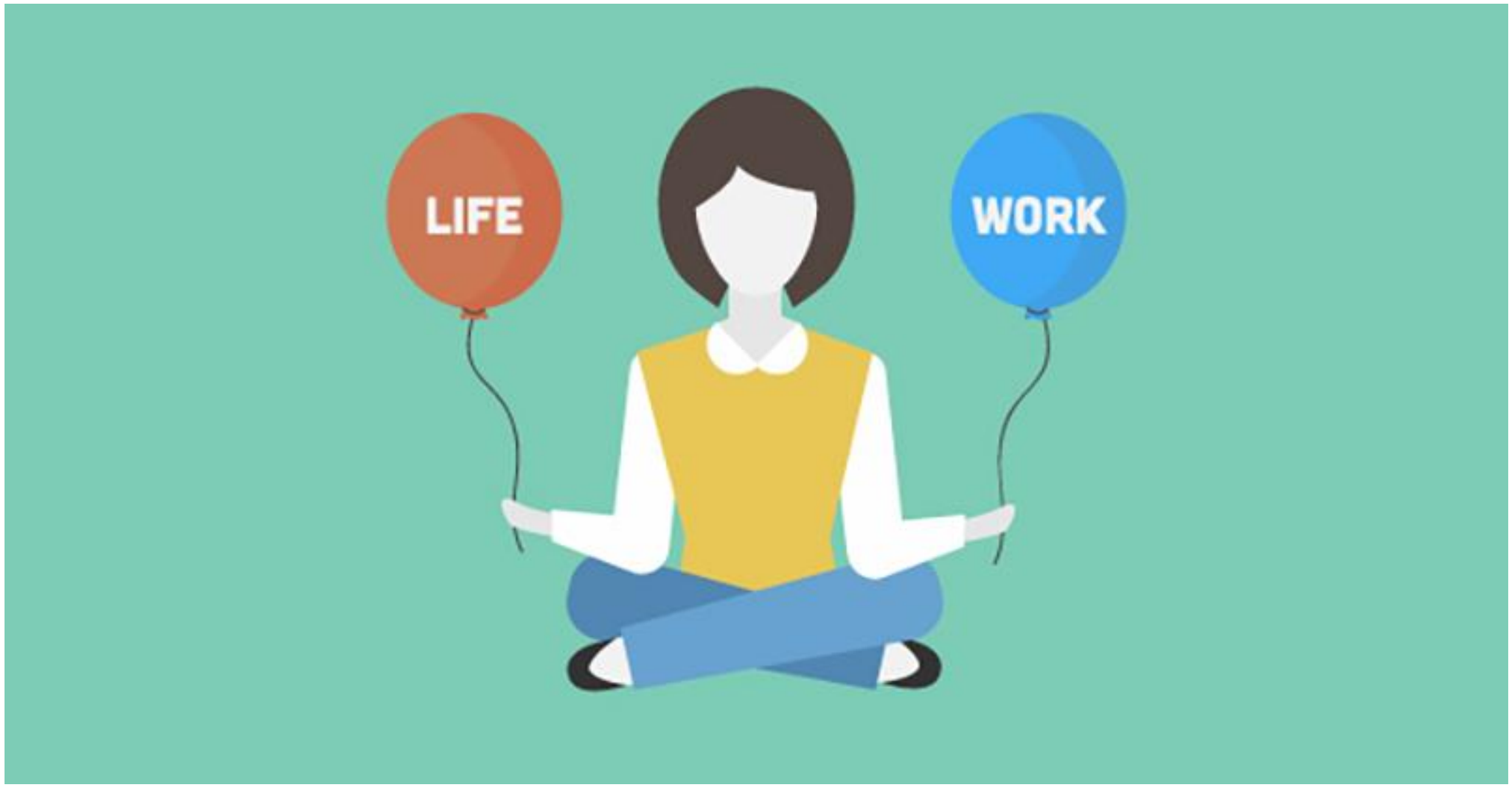
Academic Integrity

- All submitted content must be your own original content

- Copying snippets from online is fine (make sure to cite)

- Discuss ideas with each other (in person and on Discord)

Student Well-being



http://wellness.utk.edu/ http://counselingcenter.utk.edu/

SDS

Nearly 1/3rd of world's population face some form of disability!

STUDENTS WITH DISABILITIES

http://sds.utk.edu

Accommodations will be provided, please reach out!

Follow Reasonable Person Principle

- Reasonable people strike a suitable balance between their own immediate desires and the good of the community at large.
- Everyone is welcome! Be Inclusive!
- Always be kind to your fellow students
- Let’s learn together!