

# Syllabus

## Machine Learning: Applications and Practices Introduction to Meteorology

Course link: [https://people.cmix.louisiana.edu/yuan/2022\\_Summer\\_Tutorial\\_Courses.html](https://people.cmix.louisiana.edu/yuan/2022_Summer_Tutorial_Courses.html)

**Instructors:** Drs. Xu Yuan, Li Chen, Nian-Feng Tzeng, Sytske Kimball, and Eric Rappin

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### **Lecture series on Machine Learning:**

Wednesday: 10:00am – 11:15am

### **Hands-on series:**

Friday: 10:00am – 11:30am

### **Location:**

UL Lafayette Oliver Hall 113

(Students from Univ. of South Alabama, West Kentucky Univ., and Southern Univ., please use the link of <https://ullafayette.zoom.us/j/94437650828>)

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### **Lecture series on Introduction to Meteorology:**

Monday, Tuesday: 10:00am – 11:15am

### **Q&A series:**

Thursday: 10:00am – 11:00am

### **Location:**

Please use the following link for all students:

<https://wku.zoom.us/j/94776040780?pwd=a0dXWjFOQ0pXVUcxN1IzaU1xQjJHUT09>

### **Goals:**

- Attending students will learn fundamental knowledge of machine learning applications.
- Attending students will have the code practice for applying machine learning algorithms on real-world data from Twitter networks and Weather Stations.
- In addition, attending students will also learn meteorology basics through watching pre-recorded video clips at their convenient schedules, coupled with Q&A live sessions on Thursdays.

**Tentative Topics:** The Machine Learning class gives the introduction of traditional machine learning algorithms and some deep learning algorithms. The real examples are provided for practicing students to understand how to implement machine learning algorithms for handling the real-world tasks, including the classification and prediction. The Introduction to Meteorology class aims to impart basic meteorology knowledge to attending students.

Week	Agenda		
	Date	Machine Learning	Introduction to Meteorology
Week 1	06/01 10-11:15am	<b>Lecture 1:</b> Introduction of Machine Learning (Dr. Li Chen)	<ul style="list-style-type: none"> <li>● Introduction and Course Overview (05/31) (Drs. Tzeng, Kimball, and Rappin)</li> </ul>
	06/03 10-11:15am	<b>Lab 1:</b> Install Python; Run simple machine learning algorithms to warm up	<ul style="list-style-type: none"> <li>● Q&amp;A (06/02) 10-11:00am</li> </ul>
Week 2	06/08 10-11:15am	<b>Lecture 2:</b> Data Labeling (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: The sun as the primary weather Forcing factor (Dr. Rappin)</li> </ul>
	06/10 10-11:15am	<b>Lab 2:</b> Labeling Twitter Data	<ul style="list-style-type: none"> <li>● Q&amp;A (06/09) 10-11:00am</li> </ul>
Week 3	06/15 10-11:15am	<b>Lecture 3:</b> Feature Selection (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: What happens when the sun hits the Earth's Surface? (Dr. Rappin)</li> </ul>
	06/17 10-11:15am	<b>Lab 3:</b> Coding for Feature Extraction	<ul style="list-style-type: none"> <li>● Q&amp;A (06/16) 10-11:00am</li> </ul>
Week 4	06/22 10-11:15am	<b>Lecture 4:</b> Machine Learning for Twitter Classification (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: Where weather affects us: The Boundary Layer (Dr. Rappin)</li> </ul>
	06/24 10-11:15am	<b>Lab 4:</b> Coding for Each ML Algorithm	<ul style="list-style-type: none"> <li>● Q&amp;A (06/23) 10-11:00am</li> </ul>
Week 5	06/29 10-11:15am	<b>Lecture 5:</b> Neural Networks and Deep Learning (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: Forecasting Basics (Dr. Rappin)</li> </ul>
	07/01 10-11:15am	<b>Lab 5:</b> Coding for LSTM and CNN	<ul style="list-style-type: none"> <li>● Q&amp;A (06/30) 10-11:00am</li> </ul>
Week 6	07/06 10-11:15am	<b>Lecture 6:</b> Theory of Deep Learning; Introduction of Mesonet and WRF-HRRR data (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: Severe Weather (Dr. Rappin)</li> </ul>
	07/08 10-11:15am	<b>Lab 6:</b> Downloading Data of Interests and Extracting features	<ul style="list-style-type: none"> <li>● Q&amp;A (07/07) 10-11:00am</li> </ul>
Week 7	07/13 10-11:15am	<b>Lecture 7:</b> Machine Learning Modelets for Weather Forecasting (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: Hurricanes (Dr. Kimball)</li> </ul>
	07/15 10-11:15am	<b>Lab 7:</b> Running Codes for Weather Prediction Modelets	<ul style="list-style-type: none"> <li>● Q&amp;A (07/14) 10-11:00am</li> </ul>
Week 8	07/20 10-11:15am	<b>Lecture 8:</b> Machine Learning Model for Temperature Inversion Prediction (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: Measuring the Weather with Instruments and Weather Stations (Dr. Kimball)</li> </ul>
	07/22 10-11:15am	<b>Lab 8:</b> Running Codes for WeatherLore Models	<ul style="list-style-type: none"> <li>● Q&amp;A (07/21) 10-11:00am</li> </ul>
Week 9	07/27 10-11:15am	<b>Lecture 9:</b> Tweet Classification via Neural Network (Dr. Yuan)	<ul style="list-style-type: none"> <li>● Watching video clips: Observing Weather with Radar (Dr. Kimball)</li> </ul>
	07/29 10-11:15am	<b>Lab 9:</b> Reporting	<ul style="list-style-type: none"> <li>● Q&amp;A (07/28) 10-11:00am</li> </ul>

### Assignments:

- 1) Label the spam messages from Twitter data
- 2) Run the weather parameter prediction models from different Mesonet stations
- 3) Reading Articles