Westlake University Dual-Listed Undergraduate and Graduate Courses Syllabus

1.Course Information

Course Name	**Artificial Intelligence in Life Sciences**		**Credits**	**3**
Class Hours	**Teaching Hours**	**Practice Hours**	**Lab Hours**	**Total**
	48			**48**
Prerequisite courses (Consistent with major roadmap）	**Single Variable Calculus、Linear Algebra**			

2. Course Coordinator

Name	**Jianyang Zeng**	**Contact Info**	**15652782306**
Office Address	**E1-324**	**Office Hours**	**9am-6pm, Mon-Fri**

3. Course Instructor

Name #1	**Jianyang Zeng**	**Name #2**	
Contact Info	**15652782306**	**Contact Info**	
Name #3		**Name #4**	
Contact Info		**Contact Info**	

4. Course Description（No more than 500 words）

This course offers a systematic introduction to the cutting-edge applications of artificial intelligence in the life sciences. It is designed for advanced undergraduate and graduate students who are interested in the interdisciplinary intersection of AI and biology. The course covers foundational machine learning and deep learning models, as well as their applications in key areas such as structural biology, genomics, systems biology, and drug discovery.

Prerequisites:

- Calculus
- Linear Alg ebra
- Proficiency in at least one programming language (e.g., Python, R, or C++)
- Understanding of basic machine learning concepts and commonly used models (prior completion of courses like Introduction to Machine Learning or Foundations of Artificial Intelligence is recommended)

5. Learning Objectives

Upon completing this course, students will be able to:

- Systematically understand the typical application scenarios and core methodologies of artificial intelligence (AI) in the life sciences.

- Master data-driven computational modeling approaches and effectively integrate AI techniques with biological problems.

- Proficiently utilize mainstream AI frameworks to process and analyze biological data.

- Independently design and implement interdisciplinary research projects.

- Comprehend current research hotspots, challenges, and development trends at the intersection of AI and biology

6. Course Content

Putative topics include:

- Fundamental principles of machine learning and deep learning
- Applications of AI in protein structure prediction, such as AlphaFold
- Advances in molecular language models for understanding and designing gene sequences
- Graph neural networks for modeling gene regulatory networks and molecular interactions
- AI-driven methods for drug screening and molecular design
- Data modeling approaches for multi-omics integration

The course will be delivered through a combination of lectures, case studies, and hands-on projects. Students will work with real biological datasets to build practical models. Through mini-projects, group discussions, and coding practice, students will develop the ability to apply AI methods to real-world biological problems.

7. Course Schedule

Week	Session	Class Hour	Instructor(s)	Theme/Topic	Teaching activities（lecture/practical）
1	1	3	Jianyang Zeng	Introduction to Machine Learning I	Lecture, Homework
2	2	3	Jianyang Zeng	Introduction to Machine Learning II	lecture
3	3	3	Jianyang Zeng	Classical Models and Algorithms in Machine Leaning I	Lecture, Homework
4	4	3	Jianyang Zeng	Classical Models and Algorithms in Machine Leaning II	Lecture
5	5	3	Jianyang Zeng	Classical Models and Algorithms in Machine Leaning III	Lecture, Homework
6	6	3	Jianyang Zeng	Protein Structure Prediction and Design I	Lecture
7	7	3	Jianyang Zeng	Protein Structure Prediction and Design II	Lecture, Homework
8	8	3	Jianyang Zeng	Gene Regulatory Network Modeling	Lecture
9	9	3	Jianyang Zeng	Foundation Models for Genome Modeling and Design	Lecture, Course Project Proposa
10	10	3	Jianyang Zeng	AI for Drug Discovery	Lecture
11	11	3	Jianyang Zeng	AI for Proteomics I	Lecture
12	12	3	Jianyang Zeng	AI for Proteomics II	Lecture, Course Project mid-term Examination
13	13	3	Jianyang Zeng	AI for Spatial Mult-omics I	Lecture
14	14	3	Jianyang Zeng	AI for Spatial Mult-omics II	Lecture
15	15	3	Jianyang Zeng	Final Project Presentations and Course Summary I	Lecture

16	16	3	Jianyang Zeng	Final Project Presentations and Course Summary II	Lecture, Final Project

8. Assessment Weight

Type of Assessment	Percentage of Final Score	Notes
Attendance	**10%**	
Class Performance	**15%**	
Quiz		
Project	**45%**	
Assignments	**30%**	
Mid-term Exam		
Final Exam		
Other		

9.Grading

√ A. Graded

☐ B. Pass/Fail

☐ C. Hundred Point Scale

10．Textbook and Supplementary Readings

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