Bid of project
[P12]AI-based Water Resource Prediction and Management

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Project Title	AI-based Water Resource Prediction and Management
Team Members （TEAM 10）	
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Description of Team Skills

Each member of our team has his or her own strengths that can be well applied to this project. We all have a range of experience in web design and with the related language in our second year of UNNC. Our desirable skills and a great wealth of experience makes us the best choice for the team in charge of this project. Some striking evidence is as follows:

Yiming Tang has the work experience of front-end development and more profound comprehension of software engineering. That means he will communicate with customers effectively and understand their requirements accurately.

Shiliang was an excellent team leader in Y2 course FSE with a good project scheduling skill. His leadership ability will help our team to work more efficiently and orderly. Ensure our team allocate tasks reasonably and arrange the project progress properly.

Most of our team members participated in the summer research held by UNNC and gained much knowledge and experience that are valuable for this project. For instance, Yuting has basic skills of data visualization practice that will help her to implement the visualization requirements accurately in this project. Further, Yani has profited by the image processing and face recognition experience, which allowed her to understand the basic of machine learning.

We also have outstanding report writers who will help to document the outputs of each stage and integrate the final report. Yijie has accumulated a wealth of writing experience in her past study and work that is expected to generate a detailed and clear report for this project.

Other members of our group have excellent coding skills. Except we are all familiar with JAVA, C, HTML, PHP, and Matlab, Yiming Tang and Ruizi Han also have basic knowledge and simple work experience with Python.

Half of our members have work experience in UI design, which has well command of Adobe software (Ps/Pr/XD/CC).

We all have basic software engineering knowledge and orderly team management consciousness. We are able to use Versioning software for maintaining software integrity

(Members are experience with Gitlab). We already have a Github team and plan to use it during this project.

We believe we are the right team for this project because we have all of the skills required.

Content

Understanding of Project

The reason why this project appeals to us is that it aims to solve a practical environmental problem. That is how to manage water resources more efficiently in current environment where water is scarce. This project focuses on the water resources management of Ningbo. This project aims to optimize the data statistics, real-time status monitoring, and efficient management of water resources, which is quite meaningful.

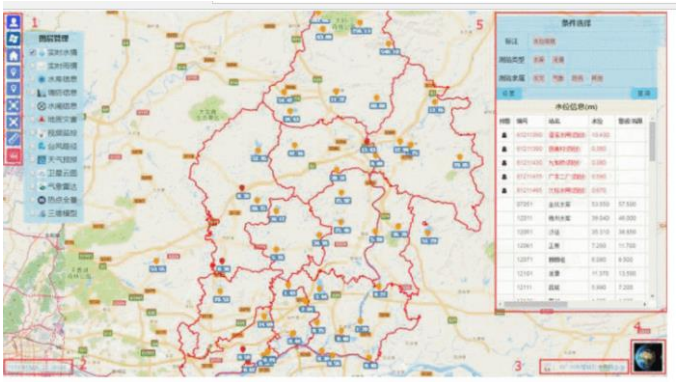

Fig.1 Example of Web interface the water conservancy integrated management system [1]

In order to better understand this project, we consulted some literature, and the following articles broadened our ideas. Firstly, [1] demonstrates an integrated management platform which involves the water level, rainfall, typhoon, meteorological data. All these data comprehensive display on a basic geographic map (detail in Fig.1). It is a great example of visualization management interface and it shows us the benefits of visualization. Moreover, Xu G , Cheng Y , Liu F , et al.[2] proposed a water level prediction model based on ARIMA-RNN, which uses the data of daily water level and environmental factors related to water level as input vector, and the water level in the next 30 days as output vector. That may be a reference model for water level prediction in the machine learning part. In addition, we are willing to contact relevant departments (e.g. Ningbo Water Resources Bureau) for on-the-spot investigation if this may help us a better understanding of the project.

Current Situation Analysis

Through browsing the official website of Ningbo Municipal Water Resources Bureau, it can be found that the information such as reservoir water level, river water level and real-time rain situation is currently displayed in the form of table, which is not intuitive and not convenient for data comparison. Moreover, for the flood warning function, the website is not perfect at present. However, the data visualization method and machine learning technology proposed by this project exactly can be used to provide help to solve the current problems of water resources management in Ningbo.

Basic Output of Project

We plan to present this project in the form of a website, that is convenient to access. The website will be mainly divided into three parts according to the project requirements.

The first part is the home page, which mainly contains an overview of water resources in recent years. It is expected to be displayed by 3D dynamic charts.

The second part is the data visualization interface, which contains dynamic charts for detailed analysis of the water resources in various regions of Ningbo, such as water level charts, water storage charts, water quality analysis charts, and regional comparison charts.

The third part is the prediction interface. We plan to present the flood warning, real-time rainfall, real-time river water level and other functions obtained by the machine learning models in the form of a 3D map.

More implementation details will be clarified in the requirements analysis stage and be implemented in the design stage.

Team Management

As mentioned, our team decided to use Github to help managing the whole project. We devote much attention to work records. Every team member will submit a work report once a week, this work report will include but what this member has done during the past week, a work plan for the coming week, issues appeared though the past week and how he or she solved it.

Team members contact with each other using Wechat during the whole process. We decide to have offline meetings at least twice a week and organize extra meetings as needed. There will be two members in charge of recording each meeting in a unified format.

Project Management

The whole project will be carried out by the six of us. Since it is a small development team and we hope to have great customer involvement, Agile project management approach will be used to embrace changes to requirements, delivers and frequent releases.
Specifically, we will use Scrum method utilising backlogs as a formal “to do list” which contains a set of tasks, worked out with you at meetings to trace our work. MSFT Planner may help us maintain backlogs.

During our development process, Sprints will be planned based on the backlogs made during the meeting. They are two-week development iterations helping us complete subtasks weekly.

Other than formal meetings with you supervisor, informal meetings stand-ups would be held weekly to make sure the efficiency of our team.

As for code quality, we have systematic ways to guarantee the whole process. The thing at the very beginning would be confirming a coding convention including comment, naming, indentation, and change log. Git will be used as version control tool. What is more, software would be developed using a test-driven development approach where appropriate and pair programming will be deployed to mostly avoid mistakes. Deep into the process, team is managed by several useful GitHub features. We use issues with labels to raise questions, distribute tasks, alert bugs, show what is to do, Doing and Done. Along with Boards, a very clear visible feature for managing tasks while clearly showing the whole process, Milestones are also used for making stage-based objectives with due time to control the productivity.

All documents mention above will be upload and keep refreshing to Github during whole process.

Project Estimate

Estimated phases：

1. Preparation

    1.1 “Github” team setup

    1.2 Background Understanding

    1.3 Requirement Analysis

2. Design

    2.1 Learning Knowledge of Visualization and Neural Network.

    2.2 Requirement Specification

    2.3 Making Project plan

    2.4 UI design

3. Development

    3.1 Preliminary data processing

    3.2 Implement visualization

    3.3 Implement prediction

4. Maintenance

5. Final Document Writing

5.1 Report Writing

5.2 Meeting minutes collection

5.3 User handbook writing

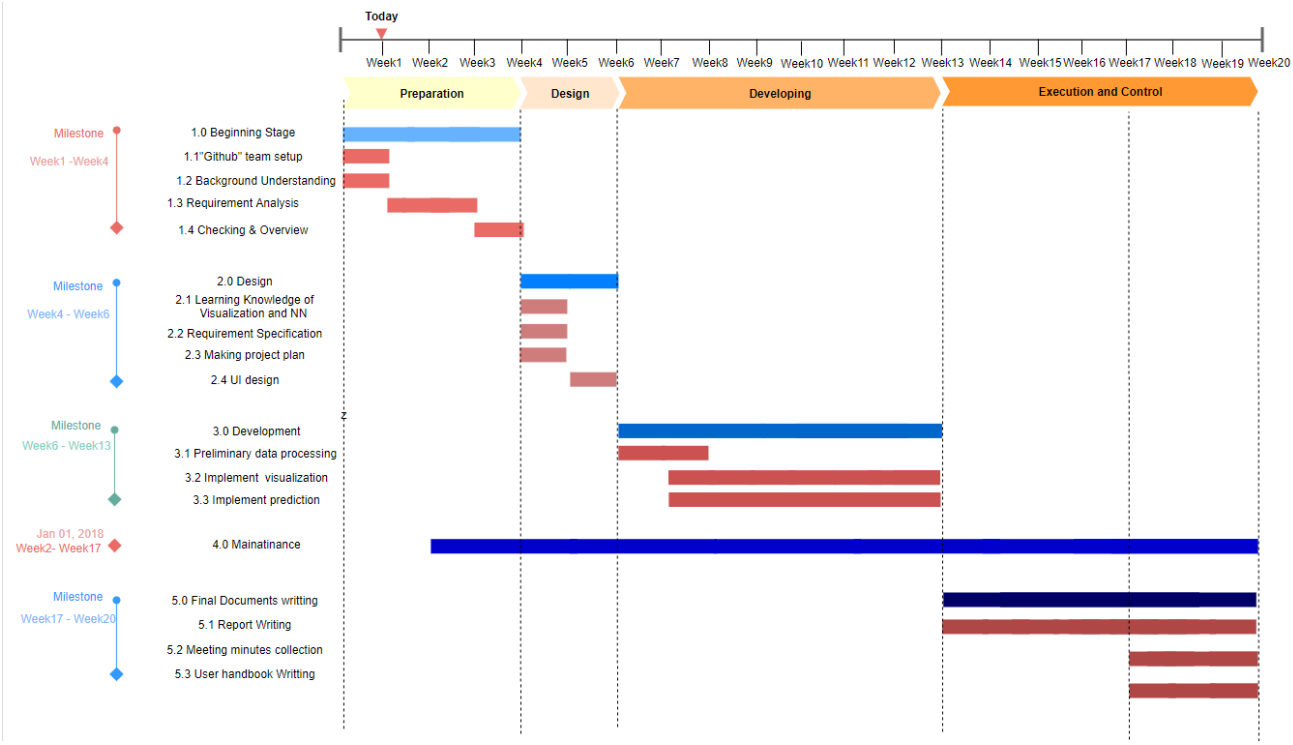

Fig2. Timeline of project

Reference:

[1] Hu, C. , Cheng, X. , Xiao, X. , Chen, Z. , & Zhao, D. . (2017). Integrated application of water informatization: A case study from Zengcheng Guangzhou China. 2017 6th International Conference on Agro-Geoinformatics.
[2] Xu, G. , Cheng, Y. , Liu, F. , Ping, P. , & Sun, J. . (2019). A Water Level Prediction Model Based on ARIMA-RNN. 2019 IEEE Fifth International Conference on Big Data Computing Service and Applications (BigDataService). IEEE.