Work:

1. Understood and learned about CMake
2. Implemented the symmetric matrix class and performed related tests.
3. Wrote a tutorial for fluid-structure interaction simulation of pipeline
4. Zhongshan Projects: For the abdominal aorta of Mr. Shi, the fluid-structure interaction analysis was performed separately for both coarse and fine meshes. And preliminary comparisons were made with the measured lumen area variation data of the aorta. Meanwhile, simulation results of CFD and FSI were also compared.

Reading:

1、Read a paper about the effect of inlet and outlet boundary condition settings on CFD simulation results for the aorta. This paper compares the differences between plug flow, parabolic flow, linear shear flow, skewed cubic flow profiles, and Womersley flow at the inlet for a specific aortic model. In addition, the differences between the two-element Windkessel, three-element Windkessel and outflow boundary conditions are compared [1].

2、Read the fifth of Mr. Hughes's ten papers According to Mr. Liu's lecture notes: PSPG method of Stokes flow accommodating equal-order interpolations [2].

3、Read a paper about LES-type variational multiscale turbulence theory, comparing the advantages and disadvantages of NURBS shape functions and traditional finite element shape functions through computational tests on homogeneous isotropic turbulence and channel turbulence[3].

4. According to the program code, read a paper about robust algorithms for finding eigenvalues and eigenvectors of symmetric matrices [4].

Reference:

[1] Madhavan, S., & Kemmerling, E. M. C. (2018). The effect of inlet and outlet boundary conditions in image-based CFD modeling of aortic flow. *Biomedical engineering online*, *17*(1), 1-20.

[2] Hughes, T. J., Franca, L. P., & Balestra, M. (1986). A new finite element formulation for computational fluid dynamics: V. Circumventing the Babuška-Brezzi condition: A stable Petrov-Galerkin formulation of the Stokes problem accommodating equal-order interpolations. *Computer Methods in Applied Mechanics and Engineering*, *59*(1), 85-99.

[3] Bazilevs, Y., Calo, V. M., Cottrell, J. A., Hughes, T. J. R., Reali, A., & Scovazzi, G. (2007). Variational multiscale residual-based turbulence modeling for large eddy simulation of incompressible flows. *Computer methods in applied mechanics and engineering*, *197*(1-4), 173-201.

[4] Scherzinger, W. M., & Dohrmann, C. R. (2008). A robust algorithm for finding the eigenvalues and eigenvectors of 3× 3 symmetric matrices. *Computer Methods in Applied Mechanics and Engineering*, *197*(45-48), 4007-4015.