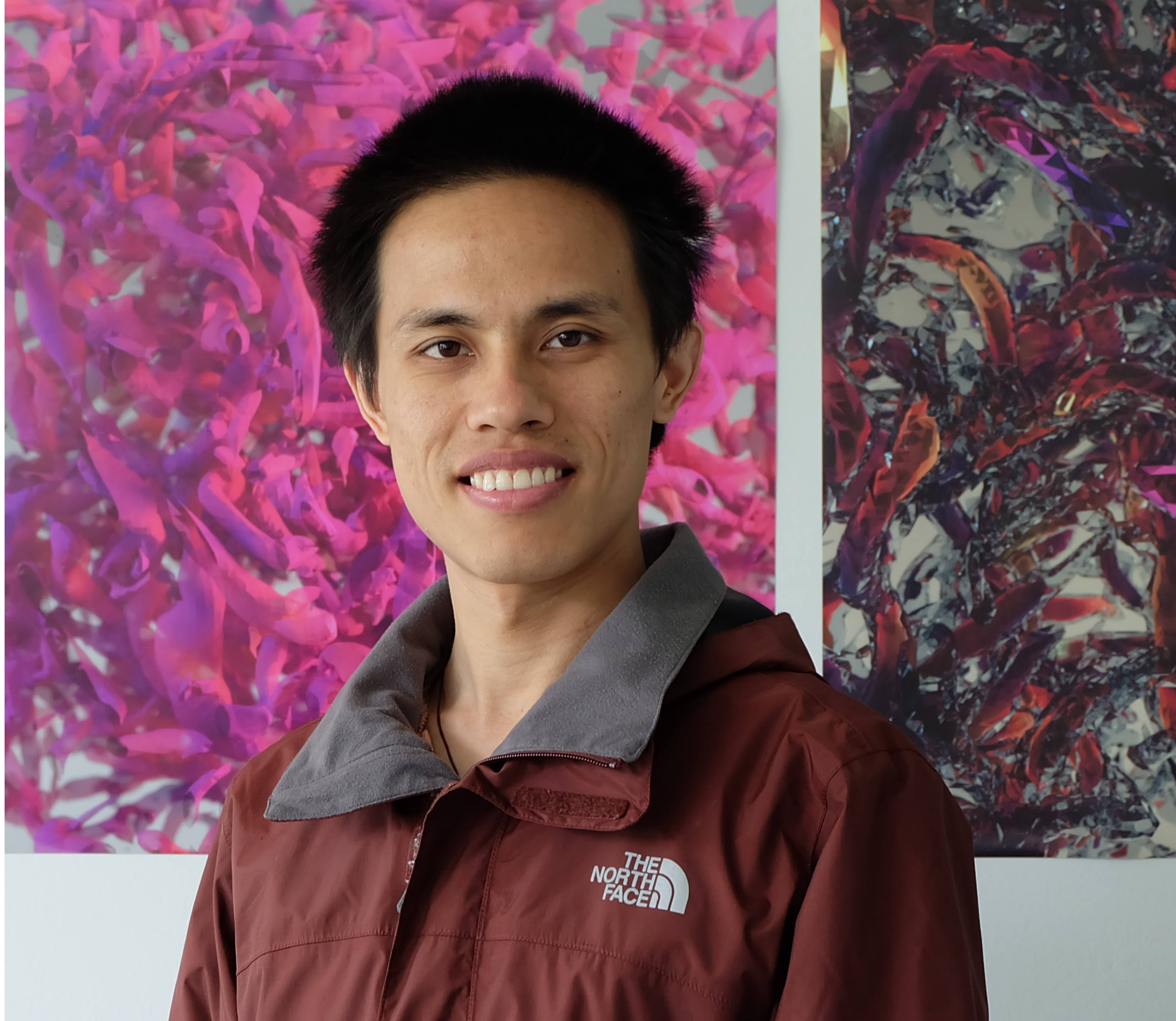


# High order TENO schemes

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## TENO schemes



## Key concept

### ENO

ENO schemes choose the smoothest stencil to capture discontinuities from a set of candidate approximation stencils.

### WENO

WENO schemes exploit a weighted average of approximations from all candidate stencils. Based on the smoothness indicators, the weights are designed to recover the ENO property for capturing discontinuities and to restore the background linear schemes in smooth regions of the solution.

### TENO

While discontinuities and small-scale fluctuations are efficiently separated by a scale-separation process, the numerical dissipation is significantly diminished by an ENO-like stencil selection, which either applies a candidate stencil with its original linear weight, or removes its contribution completely when it is crossed by a discontinuity.

## References of TENO schemes

### Ph.D thesis

Lin Fu. Numerical methods for computational fluid dynamics - a new ENO paradigm and a new domain decomposition method, Technical University of Munich, Germany, Oct. 2nd, 2017 (*Summa cum laude*).

### Journal articles

Lin Fu and et al., A targeted ENO scheme as implicit model for turbulent and genuine subgrid scales, *Communications in Computational Physics*, Accepted, in press, 2018.

Lin Fu and et al., A new class of adaptive high-order targeted ENO schemes for hyperbolic conservation laws, *Journal of Computational Physics*, Volume 374, 1 December 2018, Pages 724-751.

Lin Fu and et al., Targeted ENO schemes with tailored resolution property for hyperbolic conservation laws, *Journal of Computational Physics*, Volume 349, 15 November 2017, Pages 97-121.

Lin Fu and et al., A family of high-order targeted ENO schemes for compressible-fluid simulations, *Journal of Computational Physics* 305 (2016): 333-359.

### Conferences

Lin Fu and et al., High-order Targeted ENO Scheme for Turbulence Simulations, The 13th World Congress in Computational Mechanics, July 22, 2018 - July 27, 2018, New York, USA.

Lin Fu, Novel high order TENO schemes and new domain decomposition method, The 2nd NPU Aoxiang Forum for Distinguished Young Scholars, November 15th to 20th, 2017, Xi'an, China.

Lin Fu and et al., Implicit Large Eddy Simulations with a high-order TENO scheme, Tenth International Symposium on Turbulence and Shear Flow Phenomena (TSFP10), July 6-9, 2017, Swissotel, Chicago-IL, USA.

Lin Fu and et al., A new class of adaptive high-order TENO schemes for Hyperbolic Conservation Laws, ECCOMAS Thematic Conference: European Conference on High Order Nonlinear Numerical Methods for Evolutionary PDEs: Theory and Applications, HONOM 2017, March 27 - March 31, 2017, University of Stuttgart, Germany.

Lin Fu and et al., A high-order TENO scheme for the large eddy simulation of incompressible and compressible turbulence, *Frontiers in Applied and Computational Mathematics in honor of the 60th Birthday of Professor Chi-Wang Shu*, Division of Applied Mathematics at Brown University, USA, January 4 - 6, 2017.

Lin Fu and et al., A family of high order targeted ENO scheme for compressible fluid simulations, Ninth International Symposium On Turbulence and Shear Flow Phenomena (TSFP-9), the university of Melbourne, Australia from 30 June to 3 July, 2015.