# Paper review:

# ESN and Option Pricing

* Time series prediction using deep echo state networks <https://link.springer.com/content/pdf/10.1007/s00521-020-04948-x.pdf>

# UKF and Option Pricing

* Informative Option Portfolios in Unscented Kalman Filter Design for Affine Jump Diffusion Models <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3527094>
* Volatility Extraction in Information Based Asset Pricing Framework Via Non-Linear Filtering <https://gssrr.org/index.php/JournalOfBasicAndApplied/article/view/10051/4395>
* Stock Option Pricing Using Bayes Filters <http://www.liaolin.com/Research/optionpricing-tr.pdf>

# UKF and ESN

* An improved fruit fly algorithm-unscented Kalman filter-echo state network method for time series prediction of the network traffic data with noises <https://journals.sagepub.com/doi/full/10.1177/0142331219888366>

# Other Related Methods:

* Two Stage Particle Filter for Nonlinear Bayesian Estimation <https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8301432>

# Current Problems:

1. How to do training and testing? (testing try K step prediction)
2. Training, EM loss keeps going down. But Training prediction error become higher. (leave one out cross validation, keep the best one.)
3. Variance optimization problem. How to deal with constrains? Or is it okay that I just ignore variance optimization? (Its okay to ignore variance, **compare with LSTM**)
4. ESN sparsity cannot ensure. The system might be chaotic. What can I do? (Decomposition state space into lower dimension, uncertainty quantification, model reduction)
5. Like other papers do, how do I compare different methods? There are too much of works! Any recommendation?

(Use and compare only if code is provided)

1. Cboe data.

(LSTM, Kalman Filter, GARCH, Implied Volatility)