Some potential research projects ideas:

Read / understand / improve results from papers:

Compressive sampling / Sparse signal recovery

1. *An Introduction To Compressive Sampling*, Emmanuel J. Candès and Michael B. Wakin, IEEE SIGNAL PROCESSING MAGAZINE [21] MARCH 2008.
2. *PhaseLift: Exact and Stable Signal Recovery from Magnitude Measurements via Convex Programming ;* Emmanuel J. Candès , Thomas Strohmer , Vladislav Voroninski ; Communications in Pure and Applied Mathematics ; Volume66 , Issue8 August 2013 , Pages 1241-1274.

(S)GD optimization landscape

3. *Sharp Minima Can Generalize For Deep Nets ,* Laurent Dinh, Razvan Pascanu, Samy Bengio, Yoshua Bengio ; Proceedings of the 34th International Conference on Machine Learning, PMLR 70:1019-1028, 2017.
   see also
   On stochastic gradient descent, flatness and generalization, Yoshua Bengio, July 14, 2018, ICML'2018 Workshop on nonconvex optimization.
4. *Essentially No Barriers in Neural Network Energy Landscape,* Felix Draxler, Kambis Veschgini, Manfred Salmhofer, Fred Hamprecht ; Proceedings of the 35th International Conference on Machine Learning, PMLR 80:1309-1318, 2018.
5. *A Walk with SGD*, Chen Xing, Devansh Arpit, Christos Tsirigotis, Yoshua Bengio ; arXiv:1802.08770.

GAN – generative adversarial networks

6. *Generative Adversarial Networks,* Ian J. Goodfellow, Jean Pouget-Abadie, Mehdi Mirza, Bing Xu, David Warde-Farley, Sherjil Ozair, Aaron Courville, Yoshua Bengio ; arXiv:1406.2661.

Adversarial Examples

7. *EXPLAINING AND HARNESSING ADVERSARIAL EXAMPLES,* Ian J. Goodfellow, Jonathon Shlens & Christian Szegedy ; ICLR 2015.

Accelerated Methods for Nonconvex Optimization

8. *Accelerated Methods for NonConvex Optimization ,* Yair Carmon, John C. Duchi, Oliver Hinder, and Aaron Sidford , *SIAM J. Optim.*, 28(2), 1751–1772.