

# Machine Learning Prototypes to Solve the Inverse Problem

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Collaborators:

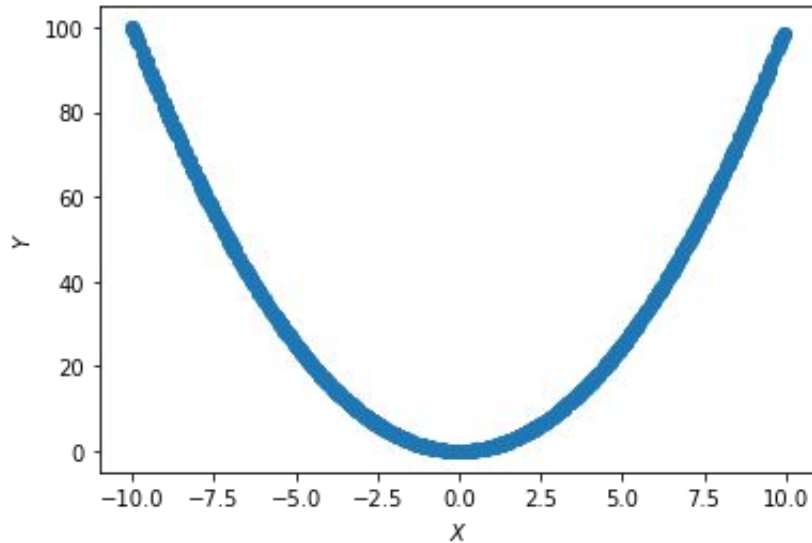
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# Machine Learning and Multiple Solutions:

$$y = x^2$$



# Machine Learning Prototypes:

A. Parameter Supervised Autoencoder (PSA)

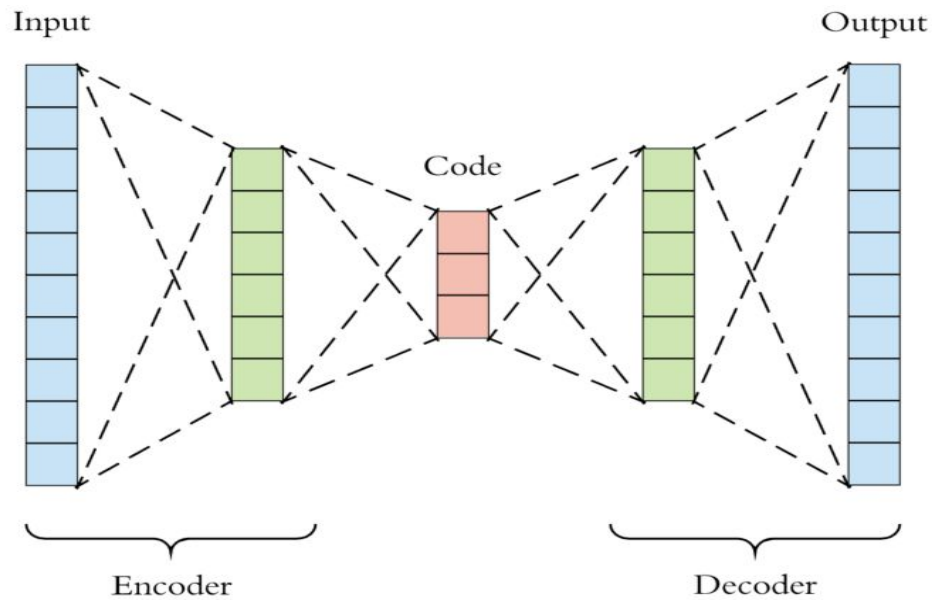
B. Mixture Density Network (MDN)

C. Parameter Supervised Autoencoder with Mixture Density Network (PSAMDN)

# Machine Learning Prototypes:

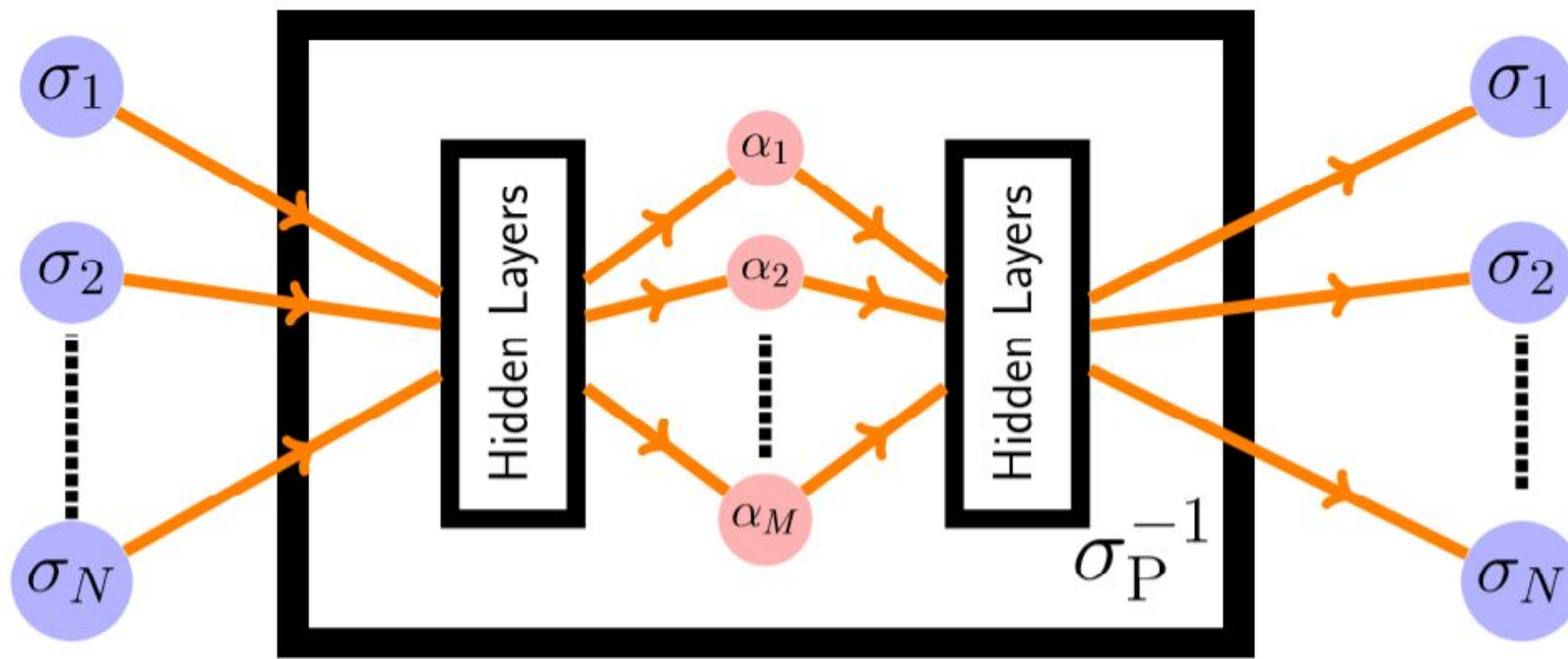
## A. Parameter Supervised Autoencoder (PSA):

- General Autoencoder:



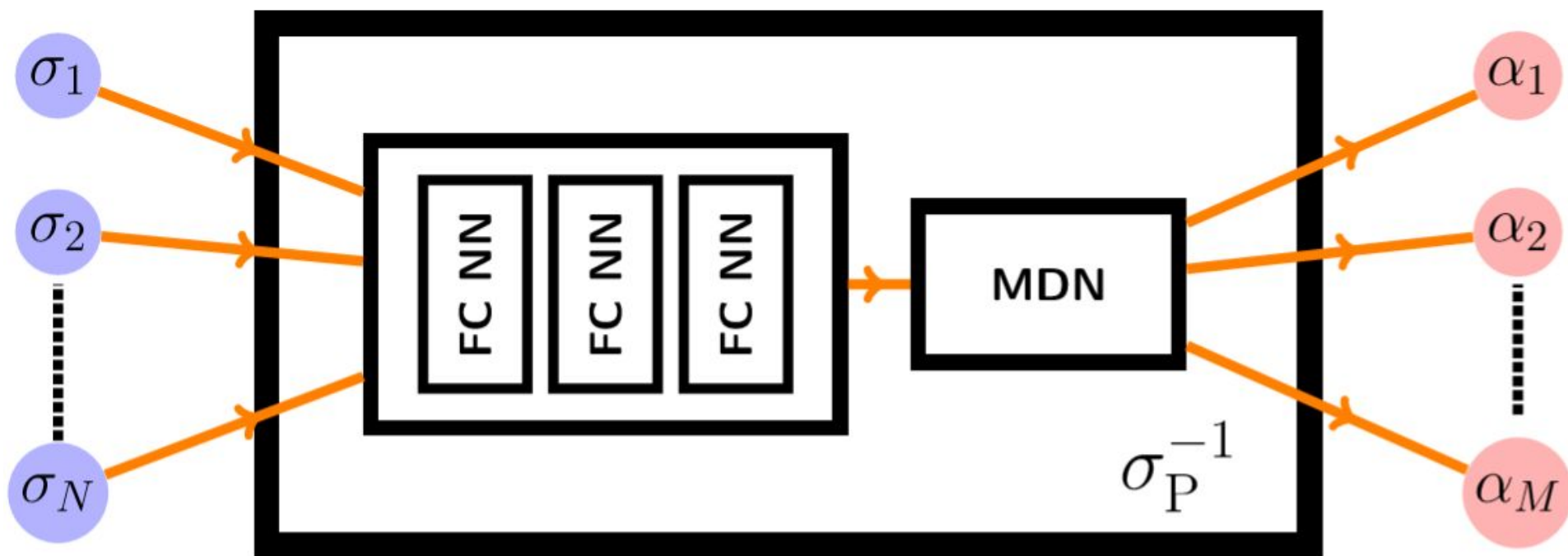
# Machine Learning Prototypes:

## A. Parameter Supervised Autoencoder (PSA):



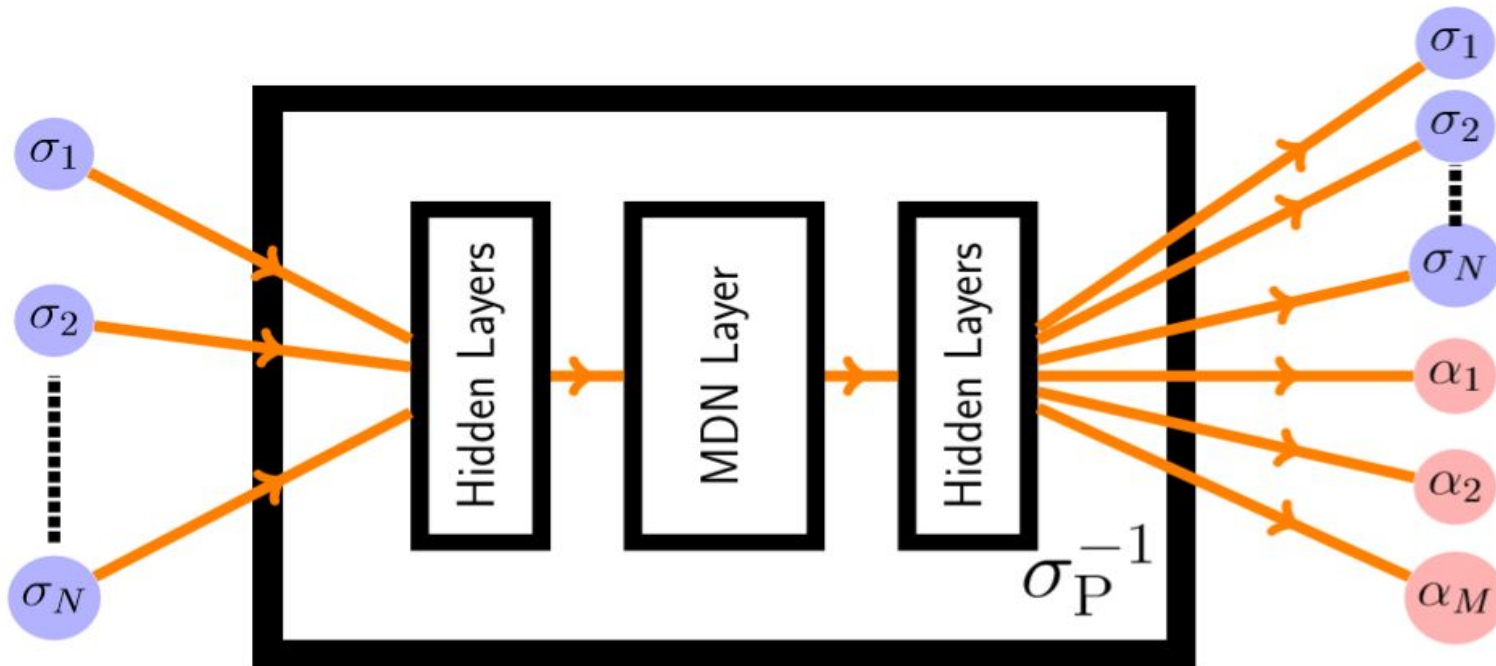
# Machine Learning Prototypes:

## B. Mixture Density Network (MDN)



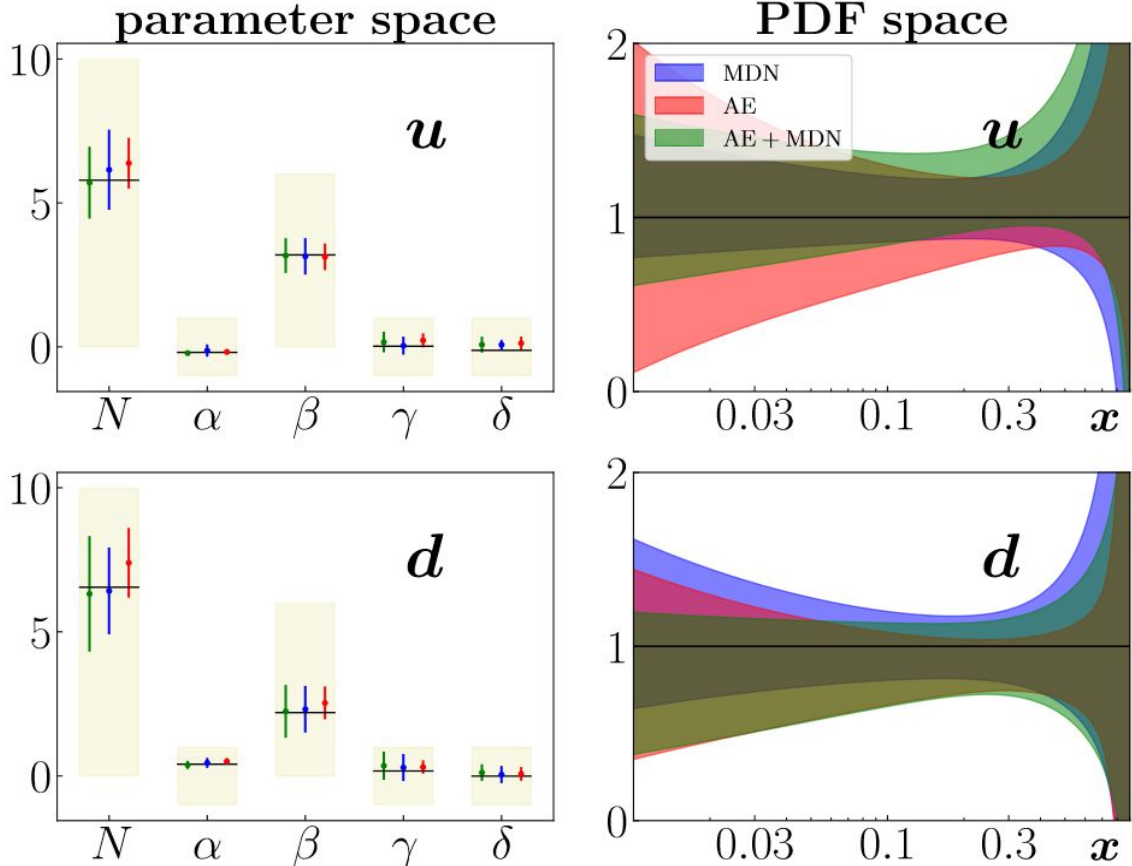
# Machine Learning Prototypes:

## C. Parameter Supervised Autoencoder with Mixture Density Network (PSAMDN)



# Machine Learning Prototypes:

Results:



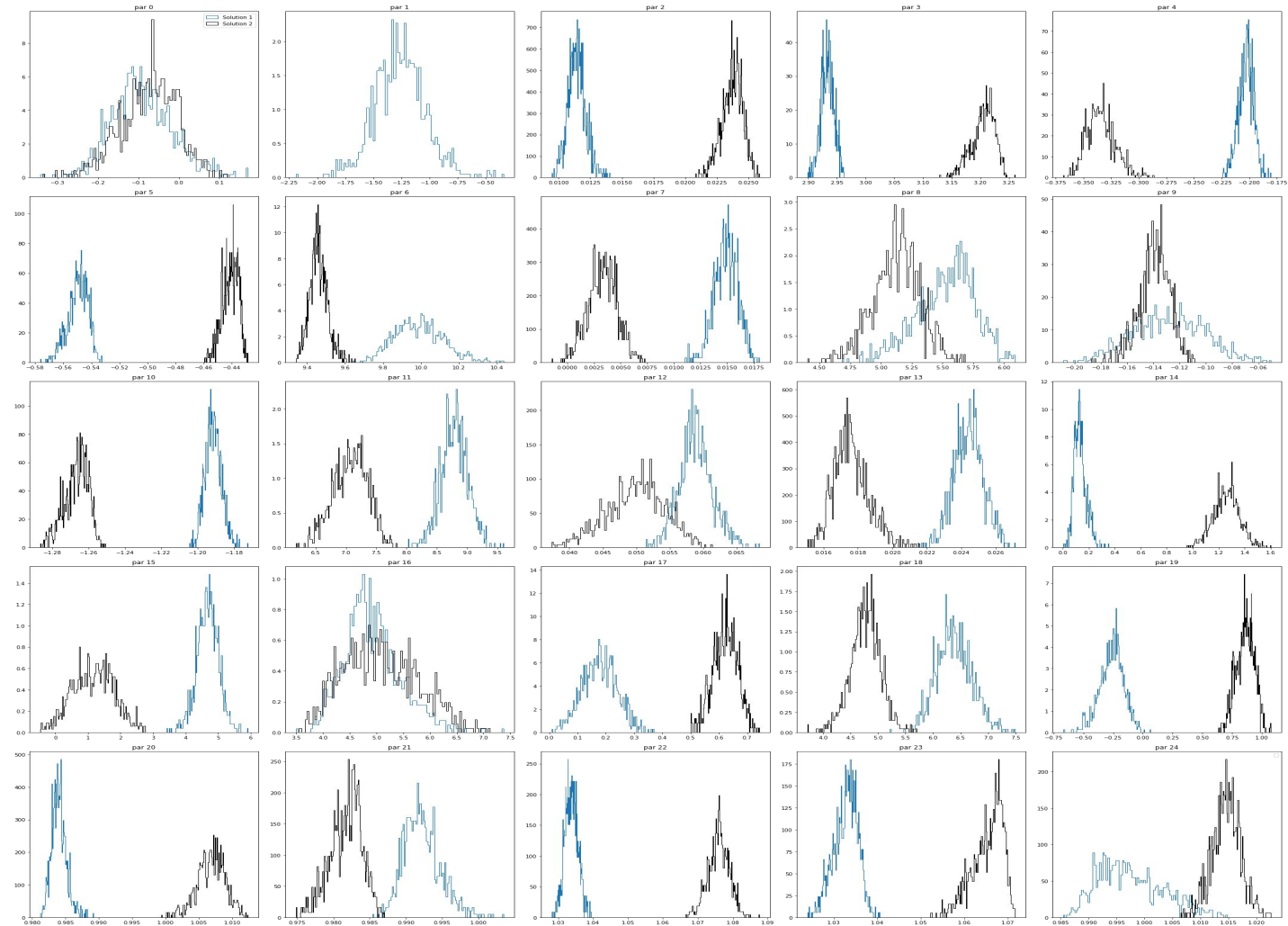
by N.Sato



# Machine Learning Prototypes:

## Results

- predicted two solution of 25 parameters for one example .
- Chi square for solution 1= 0.01
- Chi square for solution 1= 0.02



## References

- [1] D. Arden. “Applied Deep Learning - Part 3: Autoencoders,” October 3, 2017. <https://towardsdatascience.com/applied-deep-learning-part-3-autoencoders-1c083af4d798>.
- [2] I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning (MIT Press, 2016) <http://www.deeplearningbook.org>.
- [3] C. M. Bishop, “Mixture density networks” (1994).