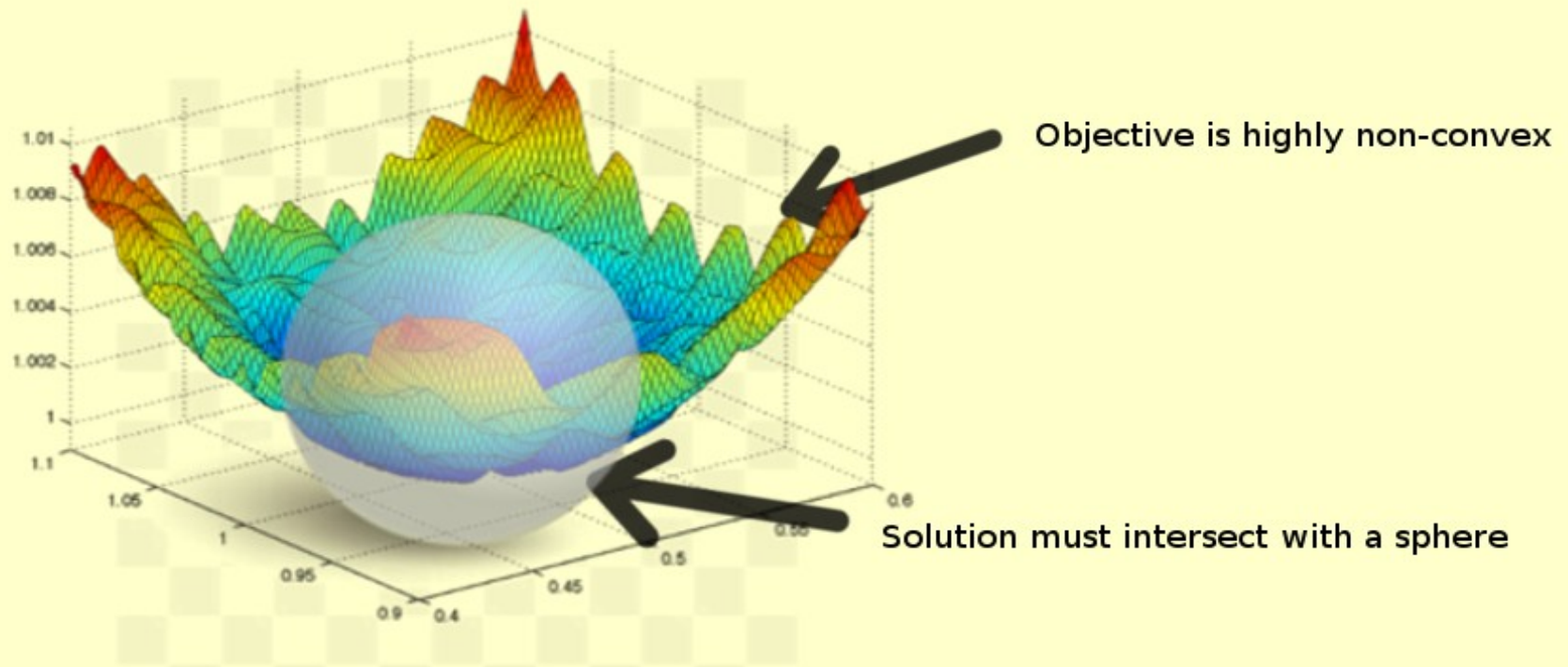


# KDAC Objective Challenges

KDAC Objective

$$\min_W - \sum_{i,j} \gamma_{i,j} e^{-\frac{\text{Tr}(W^T A_{i,j} W)}{2\sigma^2}} \quad \text{s.t. } W^T W = I$$



# ISM solution

ISM is an optimization technique that solves problems in the form of :

$$\min_W - \sum_{i,j} \gamma_{i,j} e^{-\frac{\text{Tr}(W^T A_{i,j} W)}{2\sigma^2}} \quad \text{s.t } W^T W = I$$

## Advantages of ISM

1. The solution is guaranteed to fall on the Stiefel Manifold
2. The algorithm is simple to understand and easy implement
3. Eigen Decomposition allows for approximation speed ups
4. Theoretical guarantees are proven for the 1<sup>st</sup>, 2<sup>nd</sup> condition
5. ISM is extremely fast compare to other techniques
6. ISM includes an initialization point that can be easily calculated

# KDAC Speed Challenges

KDAC is a very slow algorithm

Experiment	# of Samples	# of Features	Run Time
SG	40	2	1.51 sec
Flower	256	3	37 sec
LG	400	4	1688 sec
Moon	1000	4	54 min
MoonN	1000	7	60 min
Face	624	20	46 Hours
Webkb	1041	500	8.4 days

# KDAC Speed Improvements

ISM greatly improves the computation time  
While maintaining the quality

