# Neural Networks (2015) Project Final Phase (Phase 2)

**Principal Component Analysis (PCA) using Generalized Hebbian Algorithm (GHA)**

**Task (continue work from the first phase you implemented (Phase 1))**

For the images project, add an optional dimension reduction step PCA using GHA as described in the final lab. (*Project should be able to run both without PCA like phase 1 and with PCA*)

**Inputs**

* Number of principal components (*default 50, but can be changed*)
* Learning Rate *(Learning rate needs to be very small to prevent large numbers problem)*
* Number of epochs (*default 50, but can be changed*)

**Outputs**

No additional outputs are needed more than phase 1 outputs.

***Notes***

* *To generate the new reduced samples, after training do a single testing epoch for all the samples again and use the output for every input sample as the reduced version of that sample*
* *Normalization:*
  + *For training without PCA: make sure that normalization is done for* ***EVERY PIXEL (FEATURE)*** *across all input samples, as we consider that every pixel is a feature. (Therefore you should have* ***width x height*** *means and maximums if PCA is not used, with the first mean and max is calculated from ALL first pixels)*
  + *For training with PCA: the normalization is done* ***before*** *the reduction, not after.*

**Delivery**

* **Thursday 5/1/2017**
* **What should be delivered?**
  + **Report that contains:**
    - **At least 5 experiment runs (different parameters, error threshold, accuracy)**
    - **The details of 2 best experiment runs (in terms of accuracy rate): one without PCA and one with PCA**
  + Same Phase 1 deliverables (Images and IRIS) **+** the optional PCA step before training for images.
  + **ALL TEAM MEMBERS MUST ATTEND**
  + Program must run for successful delivery
  + Code is discussed and delivered to TA