Subspace Projection

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Background

Setting: Discrimination (Classification)

Example: 2-d b'dry of corpus collosum

- 40 Schizophrenics
- 31 Controls

"Population Shape" seen by 1st PC:

Show AxisAnim_PC1AllRaw.nb

Poor discrimination, but very stable:

Show ccf21d3sp1p2.ps

Fisher Linear Dicriminant

Great discrimination

Show top row of ccf21d3sp1p340.ps

But poor stability

Show bottom row of ccf21d3sp1p340.ps

Resulting Dir'n: driven by pixel effects

Show AxisAnim_FLDallNvsS40.nb

Problem: 2 sample means very near

Approach: study "spread", not "center"

Special Problem

- High dimension
- Low Sample Size

Idea: exploit vast size of high dimensional space.

Key on “subspaces generated by data”

(note: useless idea for large data sets, or low dimensions)

Subspace Projection

Show Toy Data in EgSubProj1Raw.ps

Idea: Project Data in Class 2, onto subspace gen'd by Class 1

Show EgSubProj1.ps

1^{st} Discrim. Dir'n is 1^{st} Eigenvector of projected data.

Data Example

- Good Discrimination

Show top 2 rows of ccf25d3sp1p1.ps

- Stable

Show second column of ccf25d3sp1p1.ps

- Finds useful directions

Show AxisAnim_ProjNSubS.nb & AxisAnim_ProjSSubN.nb