Independence

Central Limit Theorem

Non-Gaussian Assumption

Negentropy

Measurement Of Non-Gaussianity

Kurtosis: 4th Moment

Moment

Independence Related

Permutation Matrix

The ICA model $X = Lz$ holds even if we permute the order of the sources z and the corresponding columns of L. This proves the permutation ambiguity in ICA.

如果模型的交换是一起动的，那么结果不会有影响。

ICA: X = LZ, recover Z by calculating inverse of L and find Z s.t Z = WX

Total Variance Via Trace Calculation

PVEi: Proportion Variance Explained by ith PC: (Variance Explained by that PC) / (Total Variance)

Conditional Distribution X|Z

<- Joint Distribution of X and Z

<- Marginal Distribution

Factor Model Distribution - Note9 QI

Find PC1, PC2, etc

scatterplot?

projection?

regular way: ED and lagrange?

Gram Matrix: PSD

details see M2Q3 explainations

Linear Kernal PCA is Standard PCA

we can use SVD to proof

Assumptions: followed by the MVN assumptions.

Factor Analysis Model Assumptions

SVD? Others like M2Q4(b)?

First Canonical Correlation calculation

Optimization Goal

Canonical Correlation Analysis (CCA)

Variance Explained By PC

Projection, which is dot product in math

SVD

SVD can be applied to any matrix, any type and any kind.

While in comparison, ED can only be applied to square matrix.

Principle Component Analysis

Kernal PCA

Linear Regression

MLE

Least Squares

Distribution of Beta

variance?

Var(AY) = AVar(y)A^transpose, also linearity is maintaned

Mean?

also linearity is maintaned

Design Matrix

Model Definitions

Factor Analysis

看网站上MVS里的Testing部分，不仅存在ChiSquare在多变量统计语境下具体的实施手段，还有其它的t/F Testing。

Multivariate Testing

Hypothesis Testing

MIDTERM 2 CONNECTIONS

Factor Analysis and ICA (after midterm 2)

ordinary least square estimates

Linear Regression

Residuals

Definition

Joint Distribution

Conditional Distribution

Marginal Distribution

Multivariate Normal Distribution

Linear Transformation of Multivariate Normal Random Variables

Properties of MVN

Varimax Criterion

Frobenius Norm

Scoring of FA

Matrix Calculus

MIDTERM 1 CONNECTIONS

Column Space of X - C(x)

Positive Semidefinite PSD

Model Identification

不加限制的话，有无数组符合要求的Orthogonal Q，所以需要加上限制。

Idempotent

Projection Matrix is idempotent and symmetric, therefore positive semi-definite

Proof: Midterm 1 QI(a)

Idempotent's eigenvalue is either 1 or 0.

LINEAR ALGEBRA

Outer Product

nx1矩阵和nx1矩阵的outer product，其rank永远会是1

计算案例见Midterm1 Q2解析内

Orthogonal Complement

Rank

nxn matrix could span full space if all column vectors are linearly independent; while nxm matrix is called full column rank but not full space.

Orthogonal Complement Def: Midterm 1 QI(b)

Projection Complement: Q = I - P, see midterm 1 q(b)

Using PCA in FA

Diagonal of Matrix

Column Centered / Column Orthogonal

Column Centered

Column Orthogonal

How many times this eigenvalue has appeared in the matrix

Multiplicity of an Eigenvalue

Square Matrix: the trace of square matrix is the sum of all eigenvalues

Trace and Total Variance

Sample Mean / Sample Variance Matrix for Column Centered Data Matrix

mean就是相应维度的0向量，nx1；variance就是nxn的对角线矩阵，上面每一个元素都是1/n。这里不用n-1作为sample var的分母。

非对角线元素，由于column orthogonal的缘故，全都会成0