

# Selected Topics for Derivation

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## Abstract

The following are notes on the key results from the **Elements of Statistical Learning** text. They were primarily derived from course notes and readings in the Stanford STATS 315: *Modern Applied Statistics* series.

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# 1 Splines

## 1.1 Derivation: piecewise polynomials and splines

## 1.2 Interpolating natural spline minimizes smoothing spline problem

# 2 Smoothing matrices

## 2.1 Reinsch form and kernel matrix

## 2.2 Proof of kernel trick

# 3 Semi-parametric linear modeling

## 3.1 Formulation

## 3.2 Solution

## 3.3 Solution properties

# 4 Trees

## 4.1 Tree estimate

## 4.2 Improvement in loss by splitting

# 5 Neural network backprop overview