

The Lanczos Algorithm

Shane Harding

February 17, 2015

Outline of talk

- 1 Introduction
- 2 The Algorithm
- 3 Applications
- 4 Applications

1 Introduction

2 The Algorithm

3 Applications

4 Applications

Introduction

Brief History

The Lanczos algorithm was developed by Cornelius Lanczos. He developed the method while working at Boeing in the 40s. It was then forgotten for a number of years due to the lack of computers meaning that it couldn't be properly utilised. When it was then “rediscovered” it was modified multiple times to fix some instability issues.

1 Introduction

2 The Algorithm

3 Applications

4 Applications

The Lanczos Algorithm is used to solve large scale eigenvalue problems. So give a large $n \times n$ matrix A we have:

Eigenvalues and eigenvectors

$$Av_i = \lambda_i v_i$$

Where the vectors v_i are the eigenvectors and the scalars λ_i are the eigenvalues.

Power Iteration

- The Lanczos algorithm is an adaptation of the power method.
- The power methods (or power iteration or Von Mises iteration) is an eigenvalue algorithm.
- This algorithm will only produce one eigenvalue and may converge slowly.
- It finds the eigenvalue with the greatest absolute value.

1 Introduction

2 The Algorithm

3 Applications

4 Applications

Thank you!