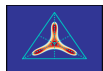


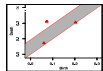
Prof. Brittany Terese Fasy



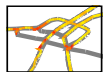
B.S., Mathematics and Computer Science
Saint Joseph's University, Philadelphia, PA



Ph.D., Computer Science, Duke University
Adviser: Herbert Edelsbrunner (IST Austria)



Postdoc: Carnegie Mellon University
CMU TopStat (stat.cmu.edu/topstat)



Postdoc: Tulane University
Applications of TDA



Associate Professor: Montana State University
Searching, Directed Topology, Homotopy Area, ...

Who are you?

- 1 State your name, major, and expected graduation.
- 2 What do you hope to do after you graduate?

Induction Recap

Hay is for Horses

And, All Horses are the Same Color

Prof. Brittany Terese Fasy

School of Computing & Dept. of Mathematical Sciences

Kyoto, Summer 2014



Kyoto, Summer 2014



But Wait!

All horses (and ponies) are the same color!

Reminder: Proof by Induction

5 Steps

1. **Claim:**
2. **Base Case:**
3. **Inductive Assumption:**
4. **Inductive Step:**
5. **Conclude!**

Reminder: Proof by Induction

5 Steps

1. **Claim:** Property A holds for all $n \geq n_0$.
2. **Base Case:**
3. **Inductive Assumption:**
4. **Inductive Step:**
5. **Conclude!**

Reminder: Proof by Induction

5 Steps

- 1. Claim:** Property A holds for all $n \geq n_0$.
- 2. Base Case:** Show Property A holds for n_0 .
- 3. Inductive Assumption:**
- 4. Inductive Step:**
- 5. Conclude!**

Reminder: Proof by Induction

5 Steps

- 1. Claim:** Property A holds for all $n \geq n_0$.
- 2. Base Case:** Show Property A holds for n_0 .
- 3. Inductive Assumption:** Let $k \geq n_0$.
Assume Property A holds for some $n = k$.
- 4. Inductive Step:**
- 5. Conclude!**

Reminder: Proof by Induction

5 Steps

- 1. Claim:** Property A holds for all $n \geq n_0$.
- 2. Base Case:** Show Property A holds for n_0 .
- 3. Inductive Assumption:** Let $k \geq n_0$.
Assume Property A holds for some $n = k$.
- 4. Inductive Step:** Prove that Property A holds for $n = k + 1$.
- 5. Conclude!**

Proofs by Induction

Problem I

For all integers $n \geq 0$, $\sum_{i=0}^n i = \frac{n(n+1)}{2}$.

Problem II

For all integers $n \geq 2$, $n^2 \geq n + 1$.

Problem III

A tree with n nodes has $n - 1$ edges.

Example of Proof by Induction

Claim:

All horses are the same color.

Base Case:

One horse is clearly one color.

Inductive Assumption:

Inductive Step:



<http://www.telegraph.co.uk/>

Example of Proof by Induction

Claim:

All horses are the same color.

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Inductive Assumption:

Any group of k horses are the same color.

Inductive Step:



<http://www.telegraph.co.uk/>



<http://www.equestrianlifemagazine.co.uk/>

Example of Proof by Induction

Claim:

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Inductive Assumption:

Any group of k horses are the same color.

Inductive Step:

Prove statement holds for $k + 1$ horses.

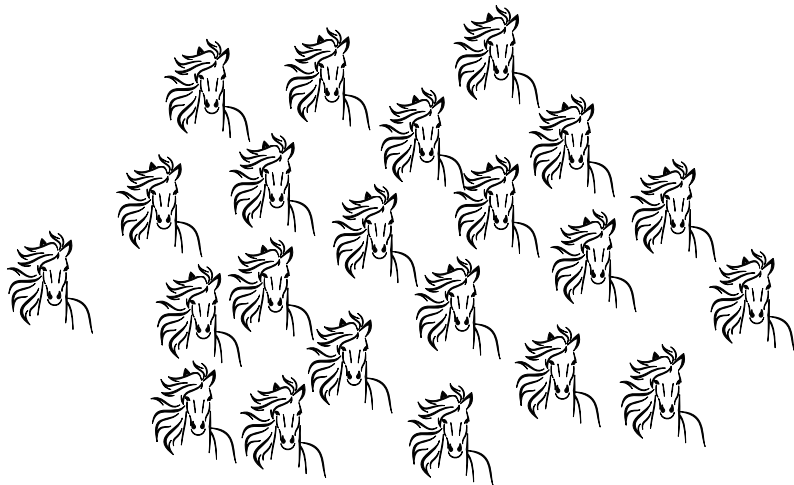


<http://www.telegraph.co.uk/>



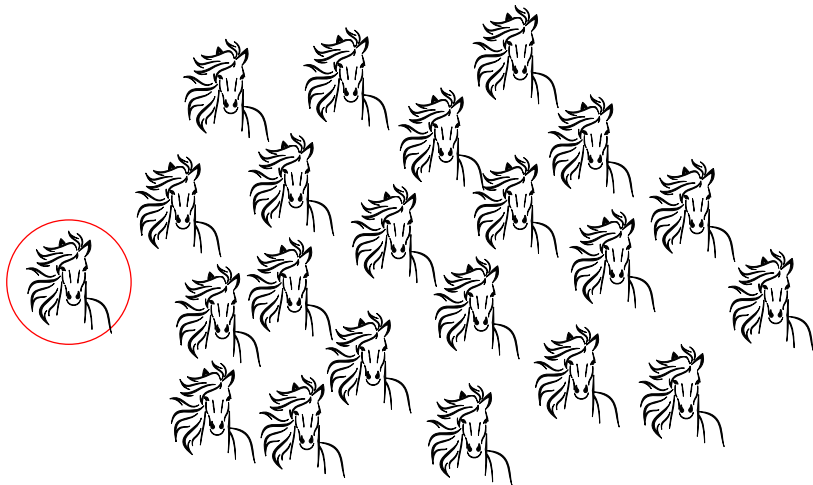
<http://www.equestrianlifemagazine.co.uk/>

The Inductive Step



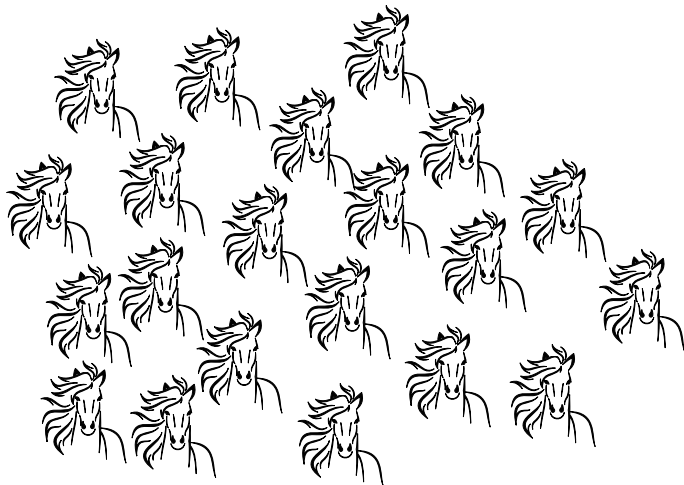
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The Inductive Step



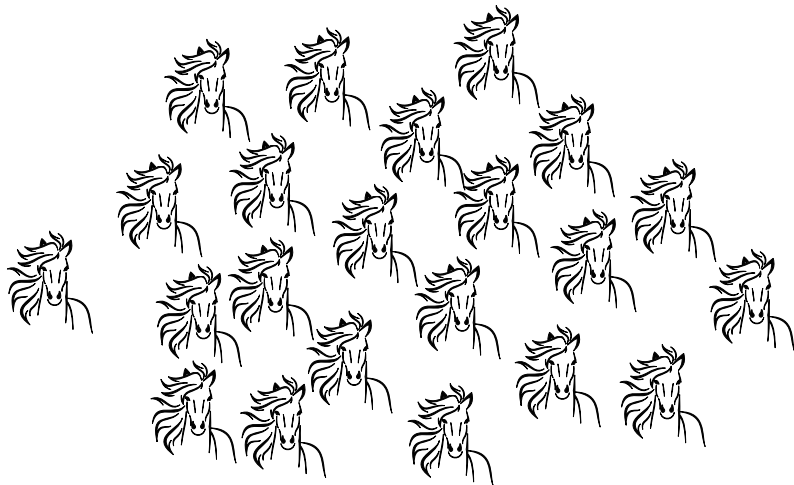
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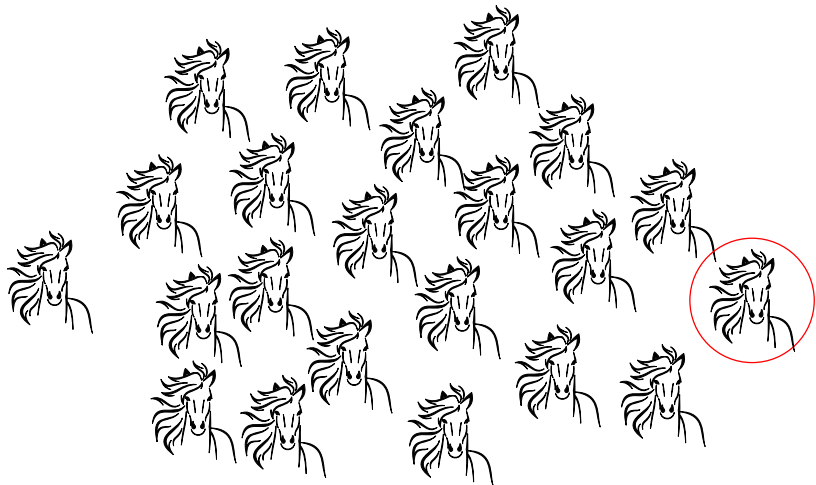
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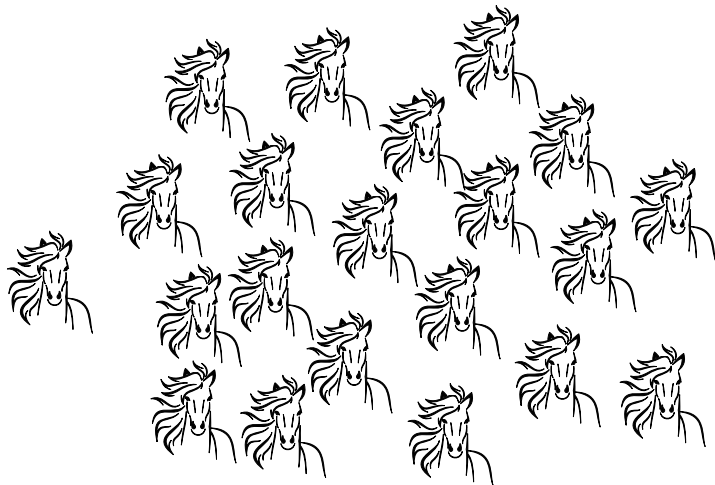
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The Inductive Step



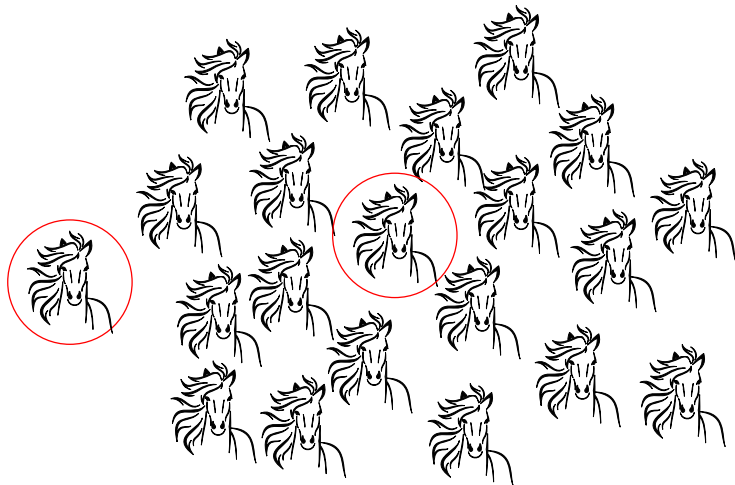
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The Inductive Step



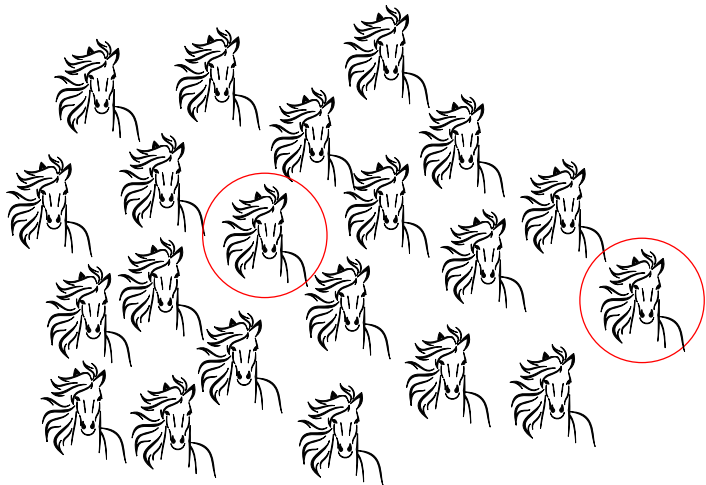
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The Inductive Step



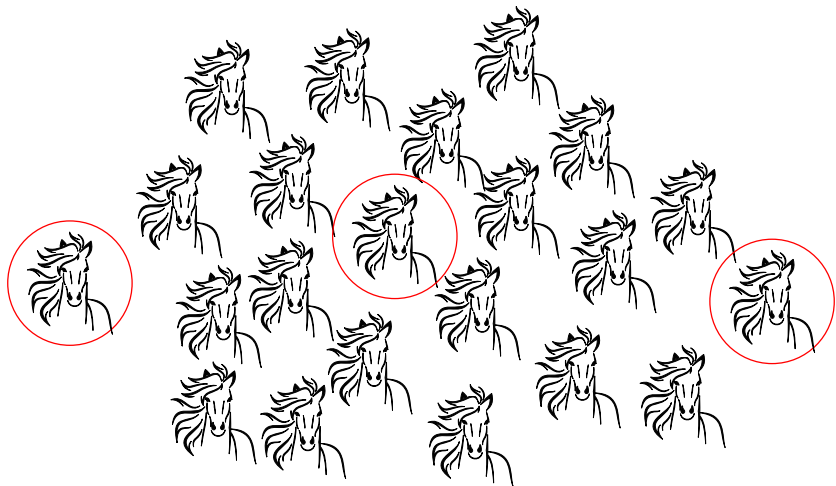
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The Inductive Step



Pferd-weiss by marauder (openclipart)

The Inductive Step



Pferd-weiss by marauder (openclipart)

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<http://www.telegraph.co.uk/>



<http://www.equestrianlifemagazine.co.uk/>

Thank You!

Email me: brittany@fasy.us

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

- The mathematician answers "5";

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

- The mathematician answers "5";
- the computer scientist "1";

Welcome to CSCI 432!

Horse Humor

Suppose we define a horse's tail to be a leg.
How many legs does a horse have?"

- The mathematician answers "5";
- the computer scientist "1";
- and the engineer says "But you can't do that!"