Exploring the Genetic Origins of Macular Degeneration:

Math 295 - Final Project

Data:

- 2004 Science Paper:

- Found two SNPs of significant association

- Came to me raw (and filled with errors)

Complement Factor H Polymorphism in Age-Related Macular Degeneration

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What is AMD?

- Effects 11 million people in the US alone.

- Blindness is caused by extracellular growths.

- Primarily seen in people aged 60+

Statistics from mayoclinic.org, photo from wikipedia.com

Data form:

- Too big to open in a text editor
- Two files: .map and .ped
- Messy...

Messy:

- Proprietary technologies result in problems

V10	V11	V12	V13
G	TRUE	TRUE	G
A	TRUE	TRUE	G
G	TRUE	TRUE	G
G	TRUE	TRUE	G
G	TRUE	TRUE	G

- There are a million nothings.

- No documentation.

What is a SNP?

- **S**ingle **N**ucleotide **P**olymorphism.
- The binary of biology.
- Come in pairs called genotypes.

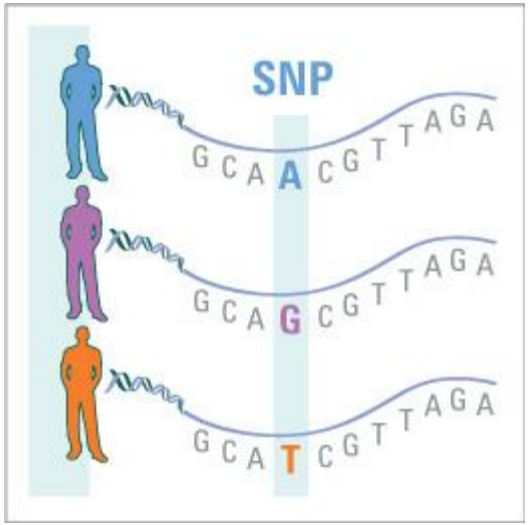


photo from broadinstitute.org

Testing for association:

phenotype	rs950122	rs1496555	rs1338382
TRUE	CG	GG	TT
TRUE	GG	AA	TT
TRUE	CG	GG	TT

- Groups are made by phenotype (or trait).

- A statistical test for association is run. (I used chi-square)

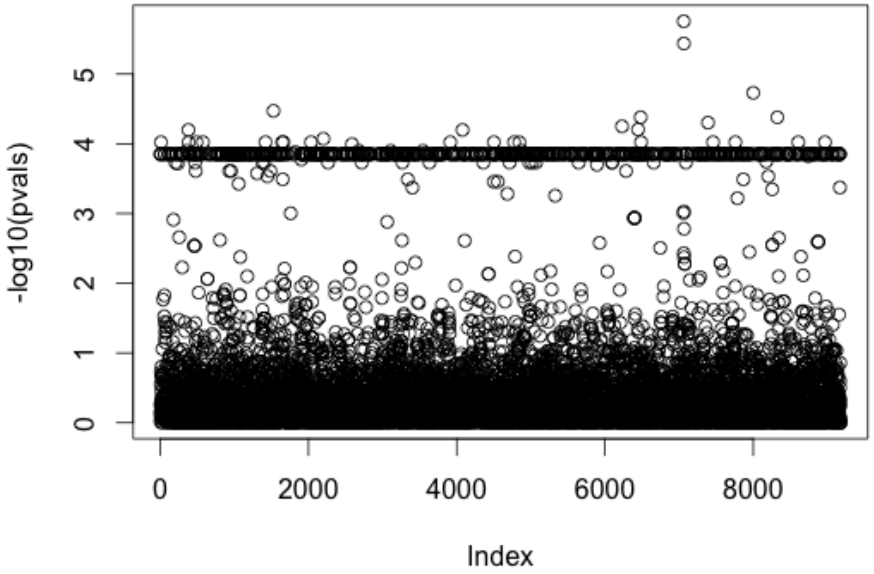
- Looped over all SNPs and plotted...

```
          rs1496555
phenotype AA AG GG
     TRUE  4 15 75
    FALSE  1 11 38
```

photo from broadinstitute.org

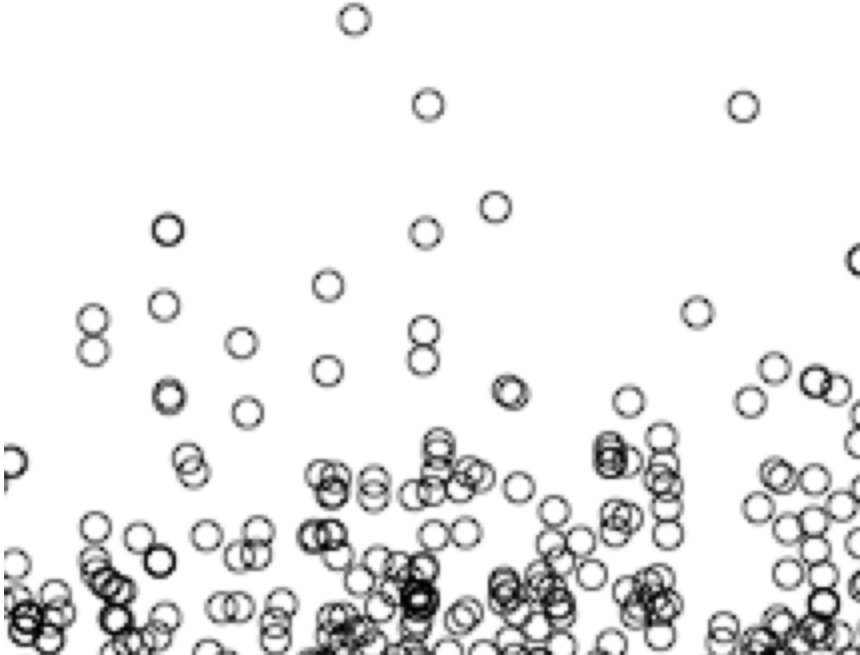
The manhattan plot:

- The big gun in genome wide association studies.
- -log10(p-value) - transforms p-values to magnitudes.
- Fantastic for seeing impacts.



The manhattan plot cont.

- Flawed...
- Hard to actually spot what’s going on.
- Labeling is almost impossible...

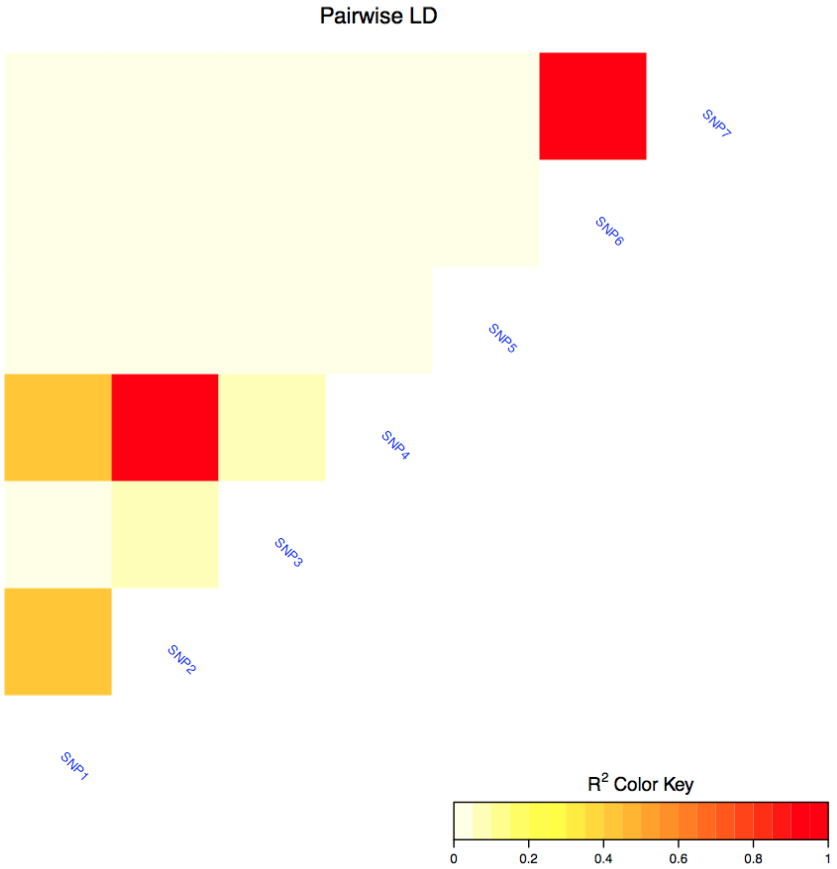


A new way:

www.uvm.edu/~nstrayer/dataFinal

Linkage Disequilibrium (LD):

- Gender differences!
- Much less LD than expected
- Tip of iceberg



Conclusion:

- New SNPs!
- A hypothesis driven follow up is necessary.
- Traits are complex.