# Sampling Theses

# Simple Random Sampling

**Protocol:** draw $n$ cases from population, each with equal probability.

- Pro: unbiased estimates, easy (?)
- Con: can be high variance

How can we draw theses with equal probability?

# Stratified Sampling

**Protocol**: partition population into *strata* that are different from one another, but are internally similar, w.r.t. a potentially influential variable.

What variables could influence number of checkouts?

- Discipline
- Year

How can we sample (proportionally) within these strata?

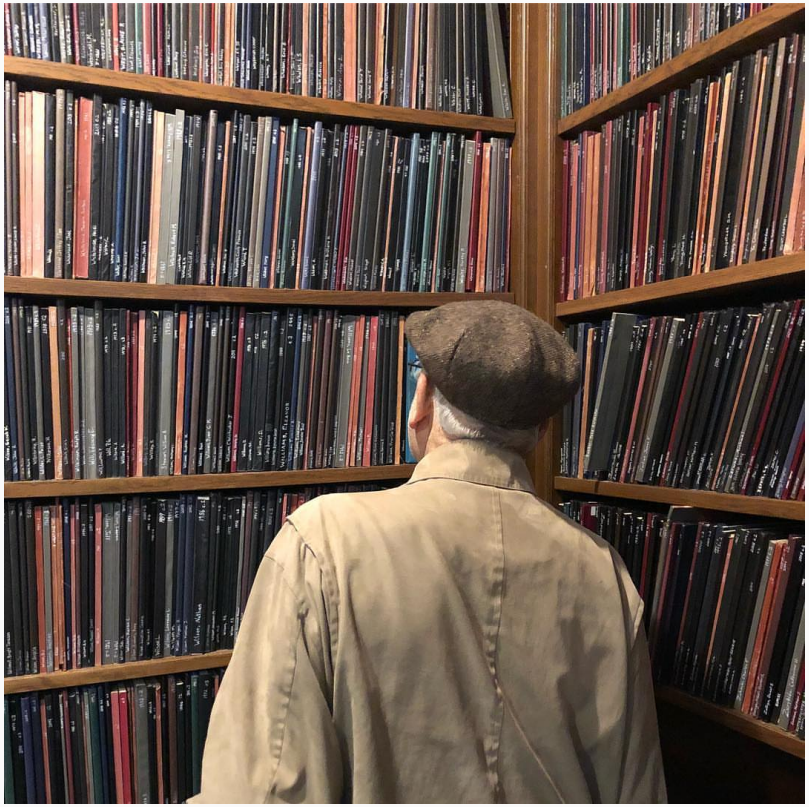
# Cluster Sampling

**Protocol**: partition population into *clusters* that are thought to be interchangable with one another. Take an SRS from those clusters and sample all cases with each cluster (or another SRS).

What could serve as a cluster?

- Columns
- Last name letter

# How many theses in the tower?



Estimates of $N$: 17,400; 37,450; 20,000; 15,000

# How do you approach this problem?

## Fermi Method

There are 25 columns of books, each with 7 shelves, each of which holds 75 theses.

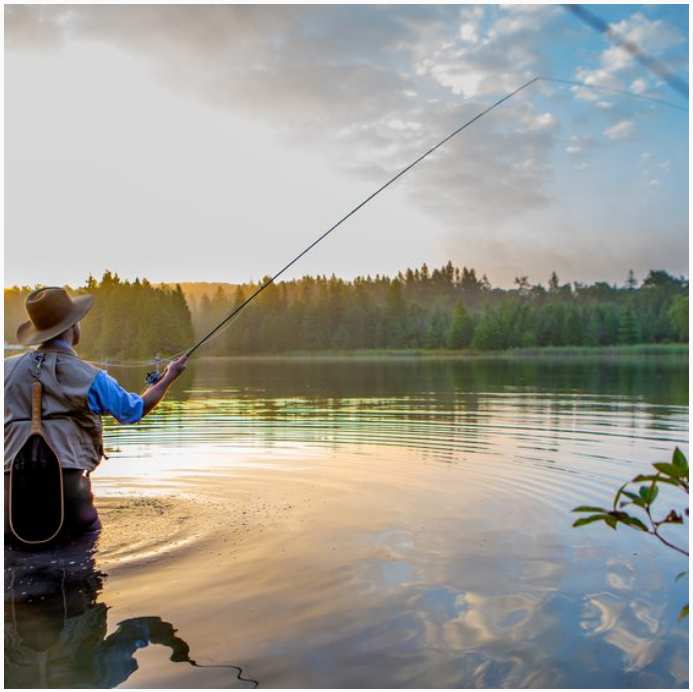
$$25 \times 5 \times 50 = 13,125 \text{ theses}$$

## Statistical Method

Gather data: Mark-Recapture

# Mark-Recapture

How many fish (N) are in a lake?



**Protocol**:

1. Visit lake, catch and mark $n$ fish.
2. Release the fish and leave.
3. Return to lake and catch $K$ fish.
4. Count the number of marked fish $k$.

# Mark-Recapture

Estimating the total number of fish in the lake.

$$\hat{N} = \frac{Kn}{k}$$

Would this work for estimating the total number of theses?

- It's not easy to randomly "catch" a thesis.

# Practical Issues

- Changing division names
- Missing cards
- Reshelving books