Synthetic Aperture Personality Assessment

A progress report and a proposal

William Revelle and Gregory Laun
Northwestern University

Synthetic Aperture Measurement

- Synthetic Aperture Measurement is done in visual and radio astronomy by combining input from multiple, linked sites into one coherent image
- Classic example is radio astronomy at the Very Large Array (Socorro, New Mexico)
- Visual Astronomy will use similar techniques at Keck Observatory with “outriggers”

NRAO / AUI / NSF

Very Long Array

NRAO / AUI / NSF

Very Long Array

NRAO / AUI / NSF

NRAO / AUI / NSF

SAPA: Synthetic Aperture Personality Assessment

- Not particular new or original, early work was done (and is still being done) at ETS on the SAT and GRE
- Techniques are now available for SAPA for all of us

SAPA: Overview

- Develop item statistics and item-item covariances on large (N > 2000) item pools by randomly presenting small (N ≈ 60-80) subsets of items to different subjects taken from a very large (N > 11,000 and growing 100/day) subject population

SAPA: Method

- Item Pool: International Personality Item Pool (Goldberg)
  - Particular emphasis upon marker sets of "Big 5"
- Subjects: recruited from visitors to the Personality Project (roughly 1-2000/day visitors) -> ≈ 100 day participants

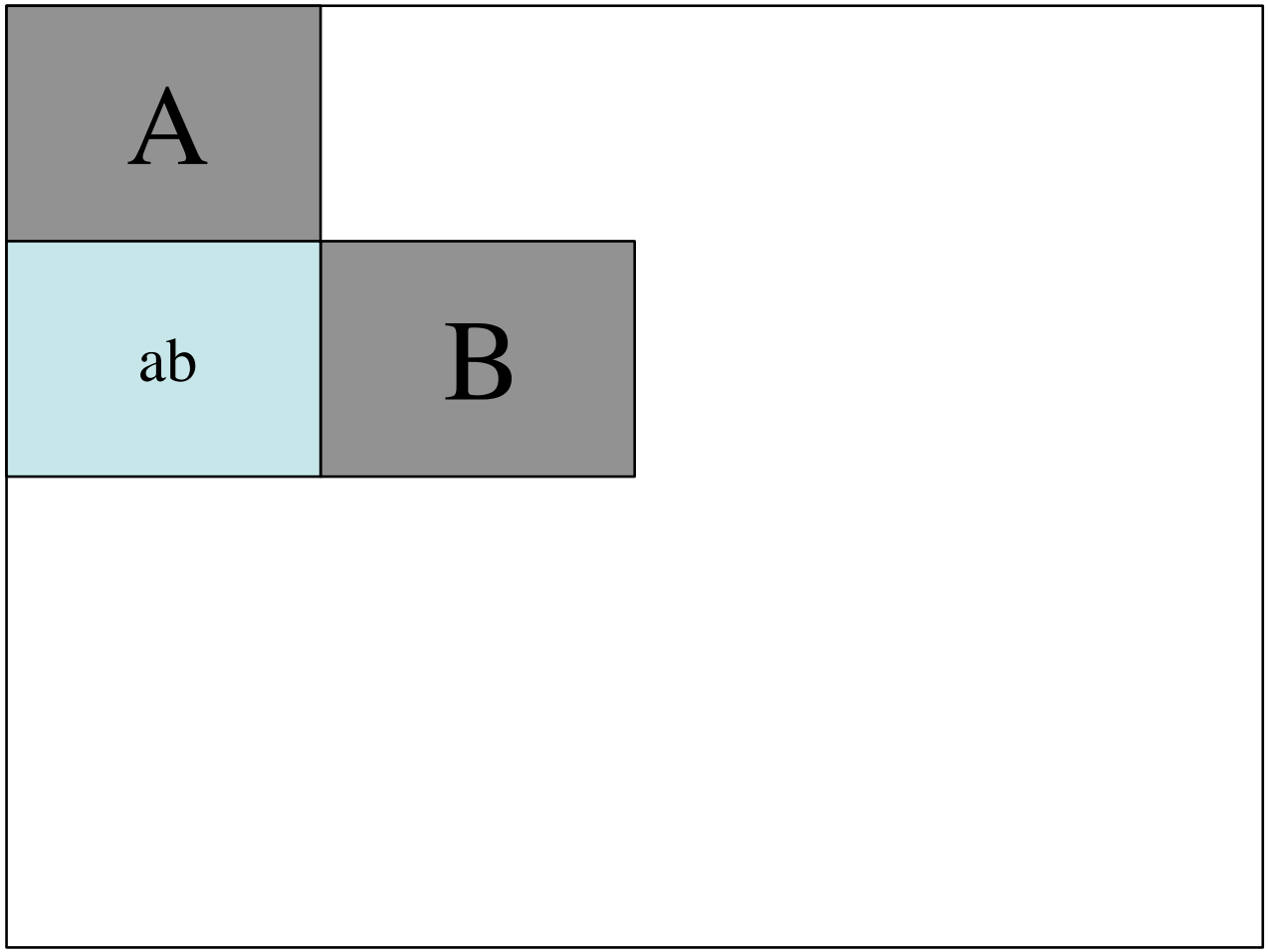
  Provide feedback as an incentive (Johnson)
- Methods: public domain applications
  - mySQL, Apache, PHP, HTML, R

SAPA: basic concept

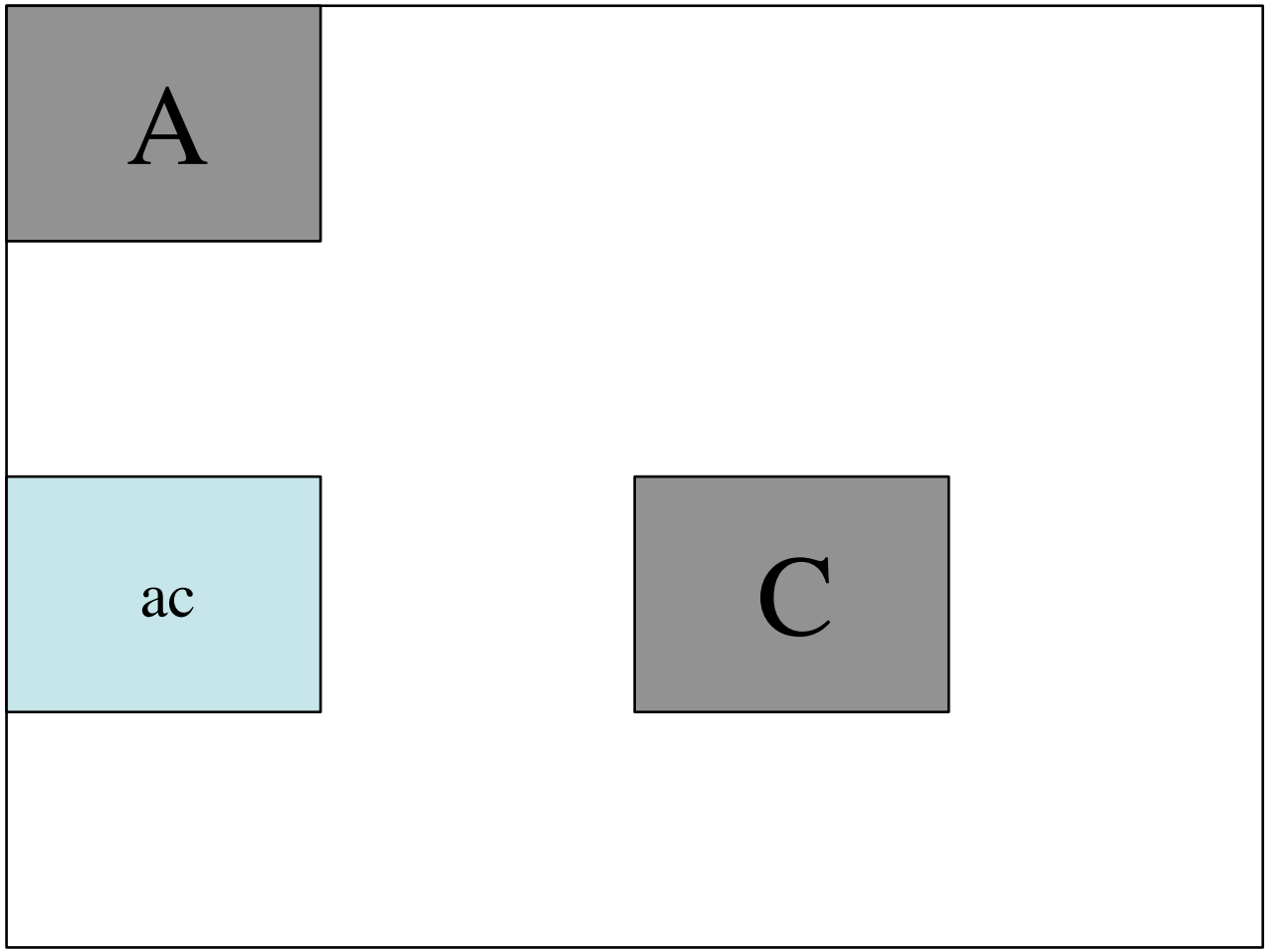
- Consider an item pool of P items divided into m sets e.g., P =120, m = 4 produces sets A, B, C, D of 30 items.
- Each subject (N >> 100) is given 2 sets of items
  - E.g., (A+B, A+C, … C+D)
- Sample size n for basic set (e.g., A) is 2N/m,
- Sample size n_{ij} for correlations between item subsets (e.g., A by B) = 2N/(m*m-1)

SAPA: conceptual demonstration

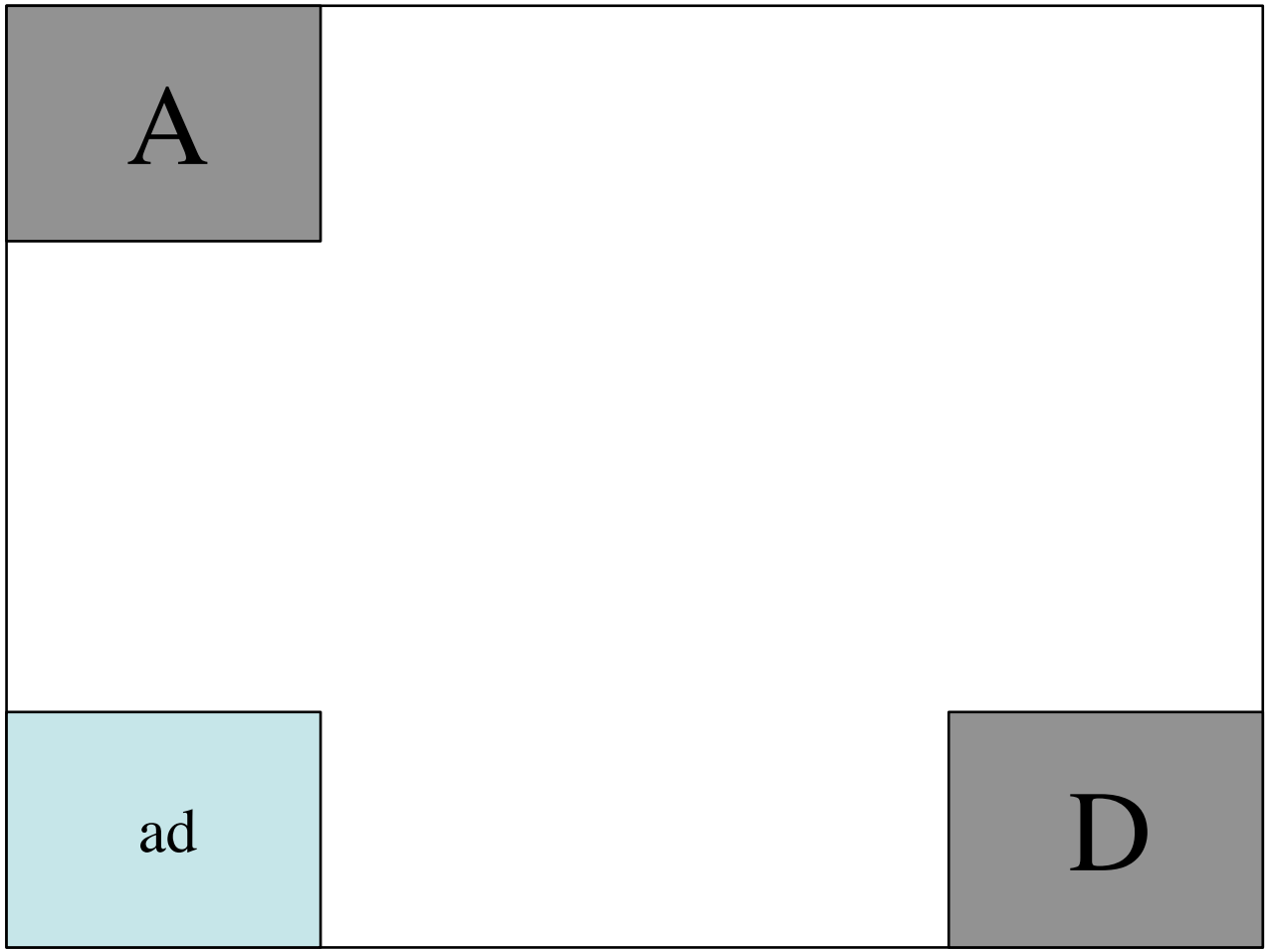
Basic Model



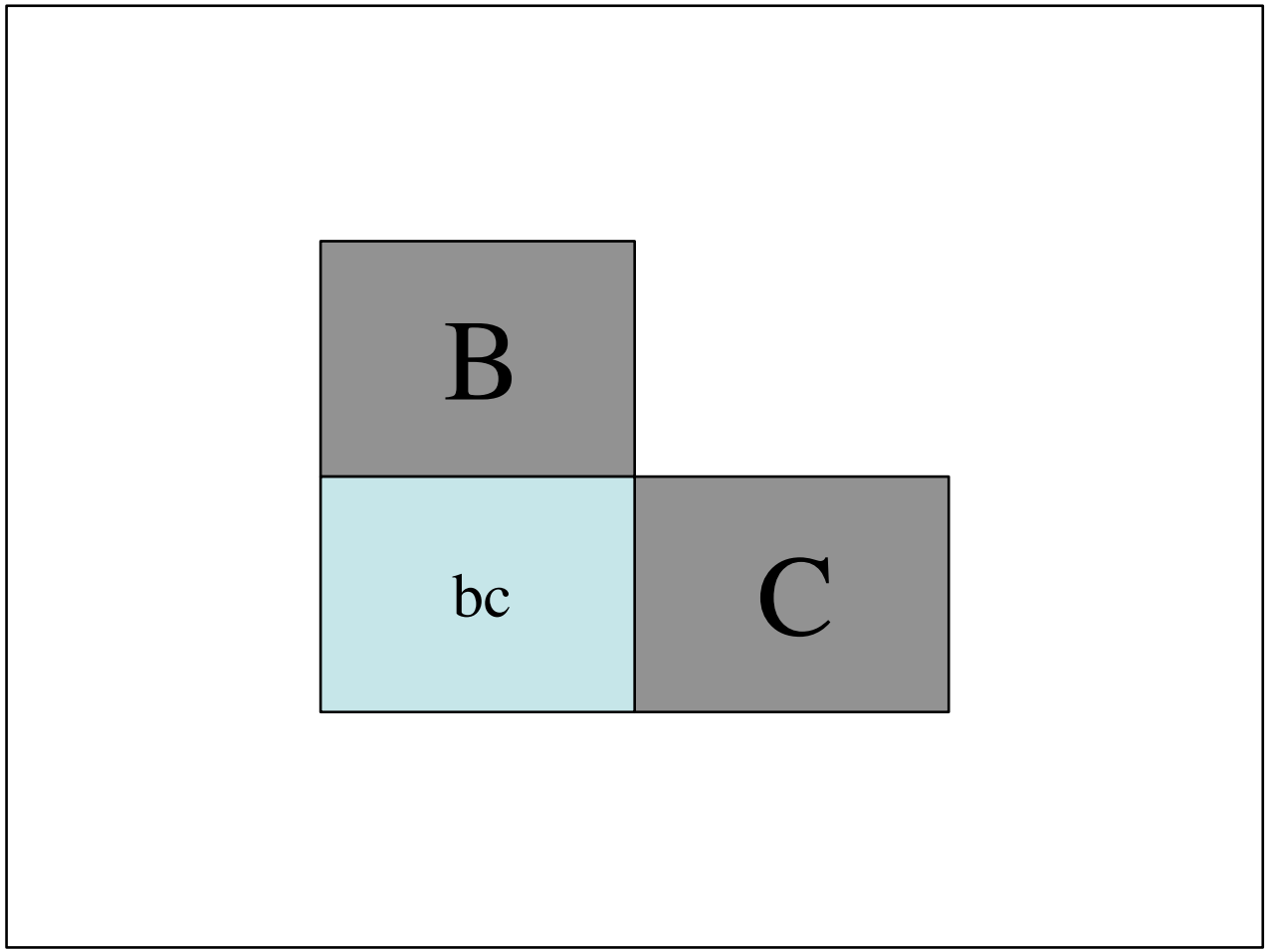
Basic Model



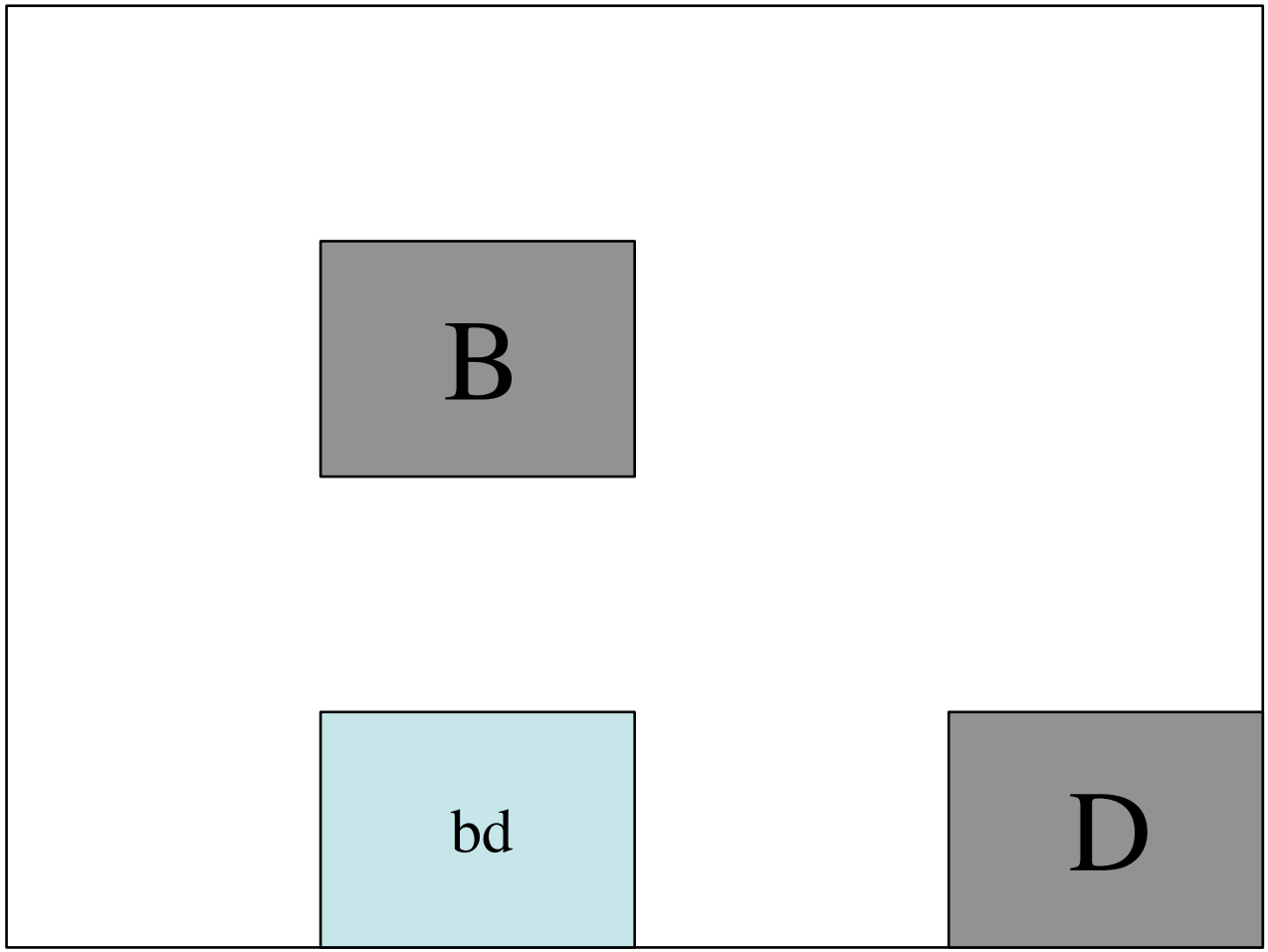
Basic Model



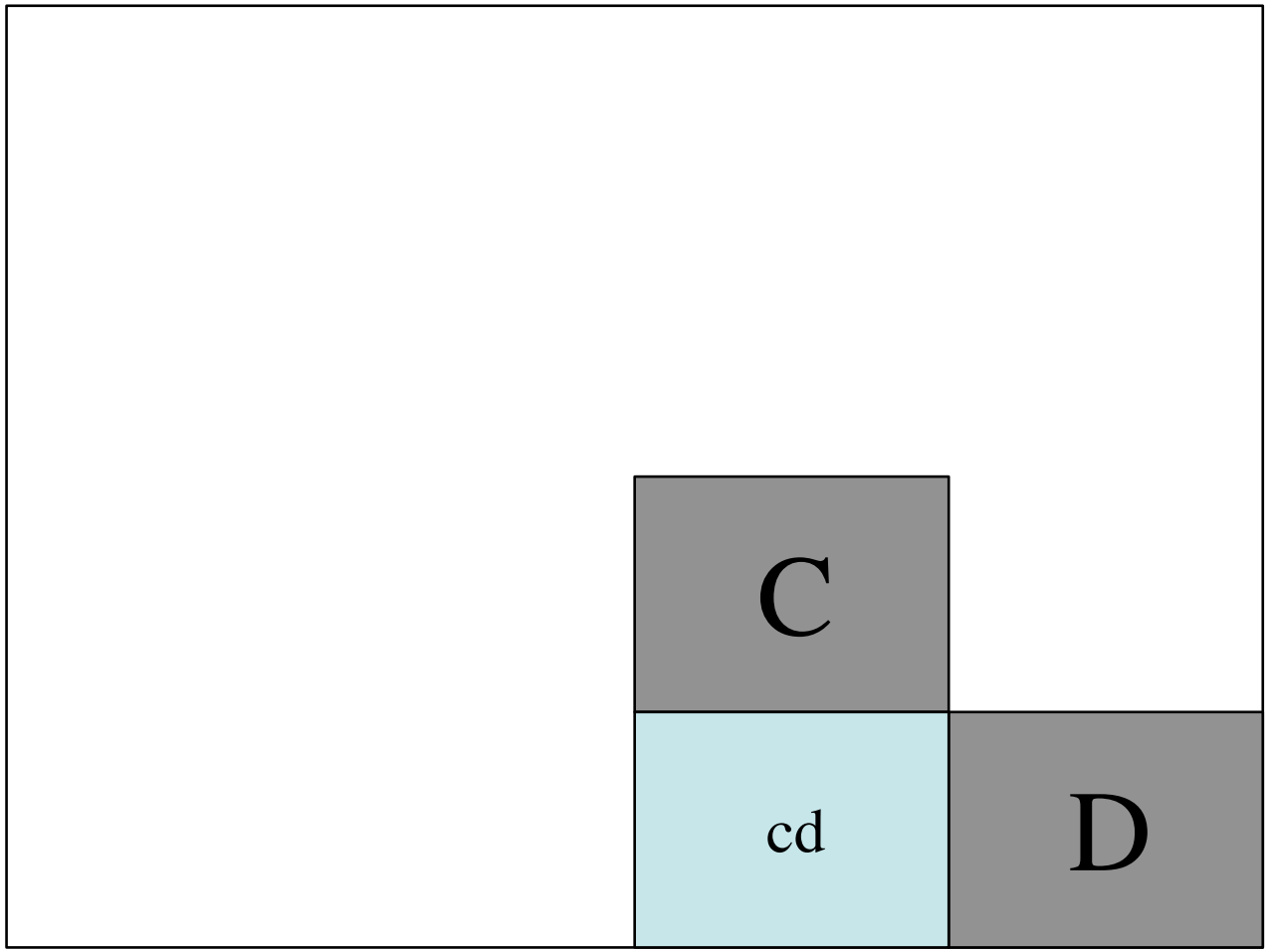
Basic Model



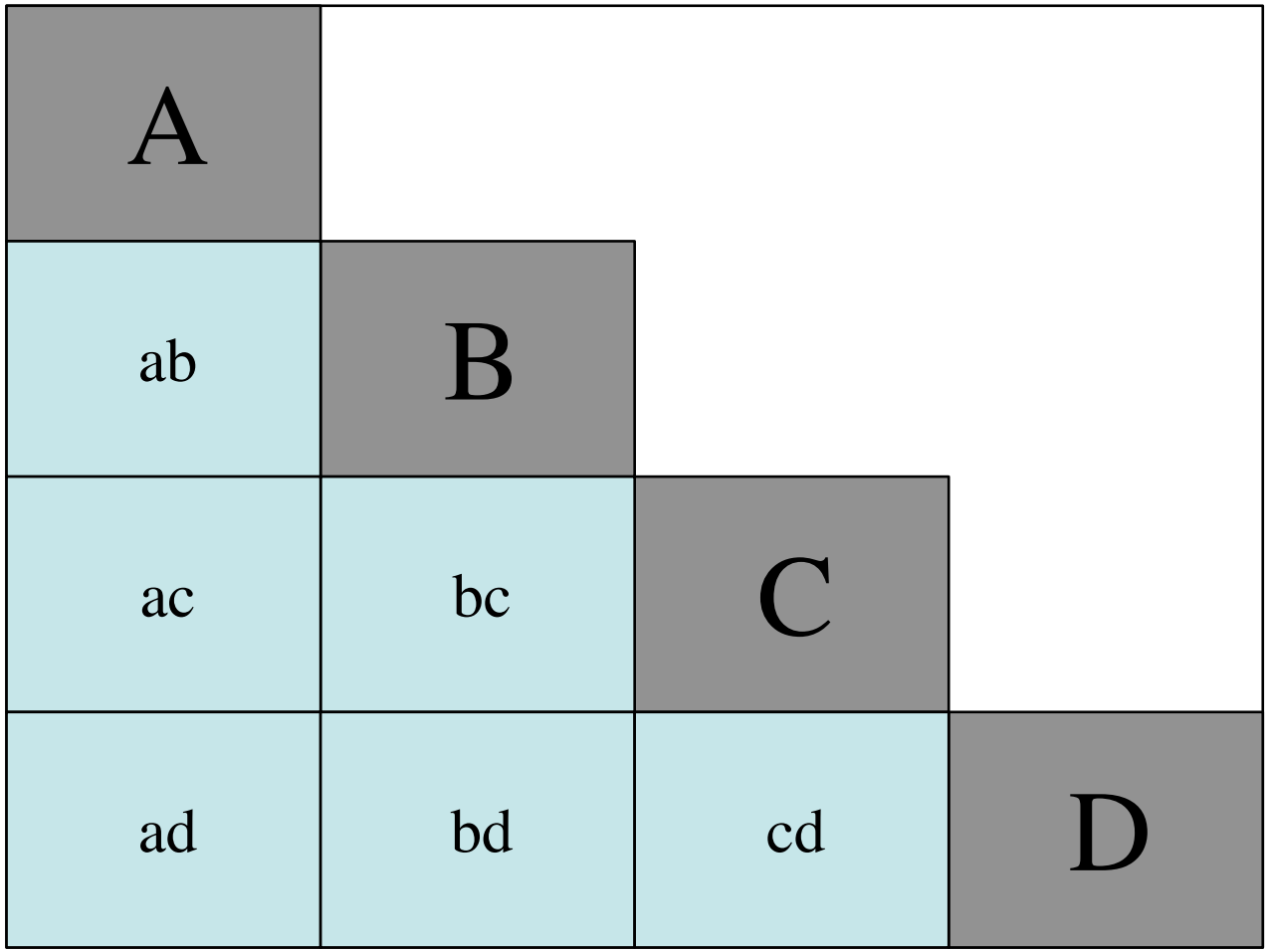
Basic Model



Basic Model



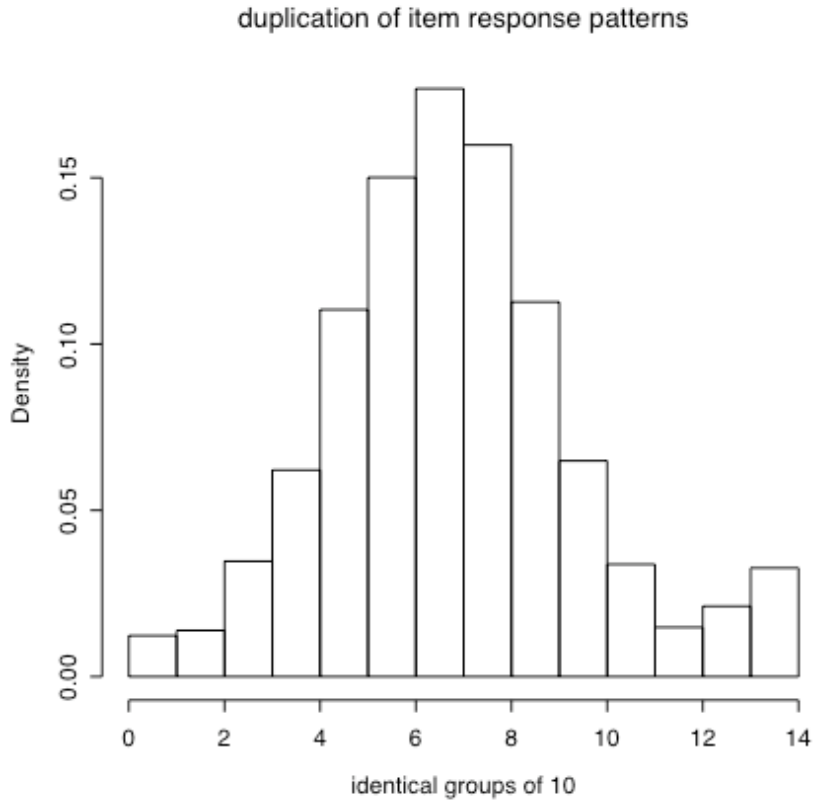
Basic Model



SAPA in operation

- 11,046 records since March, 2004
- About 200 duplicate records (identical except for ID number -- suggests hitting return key twice)
- Some visitors are clearly trying out the system and change one or two items and then resubmit
- Duplication measure as count of duplicate blocks of 10 items

Distribution of near duplicates

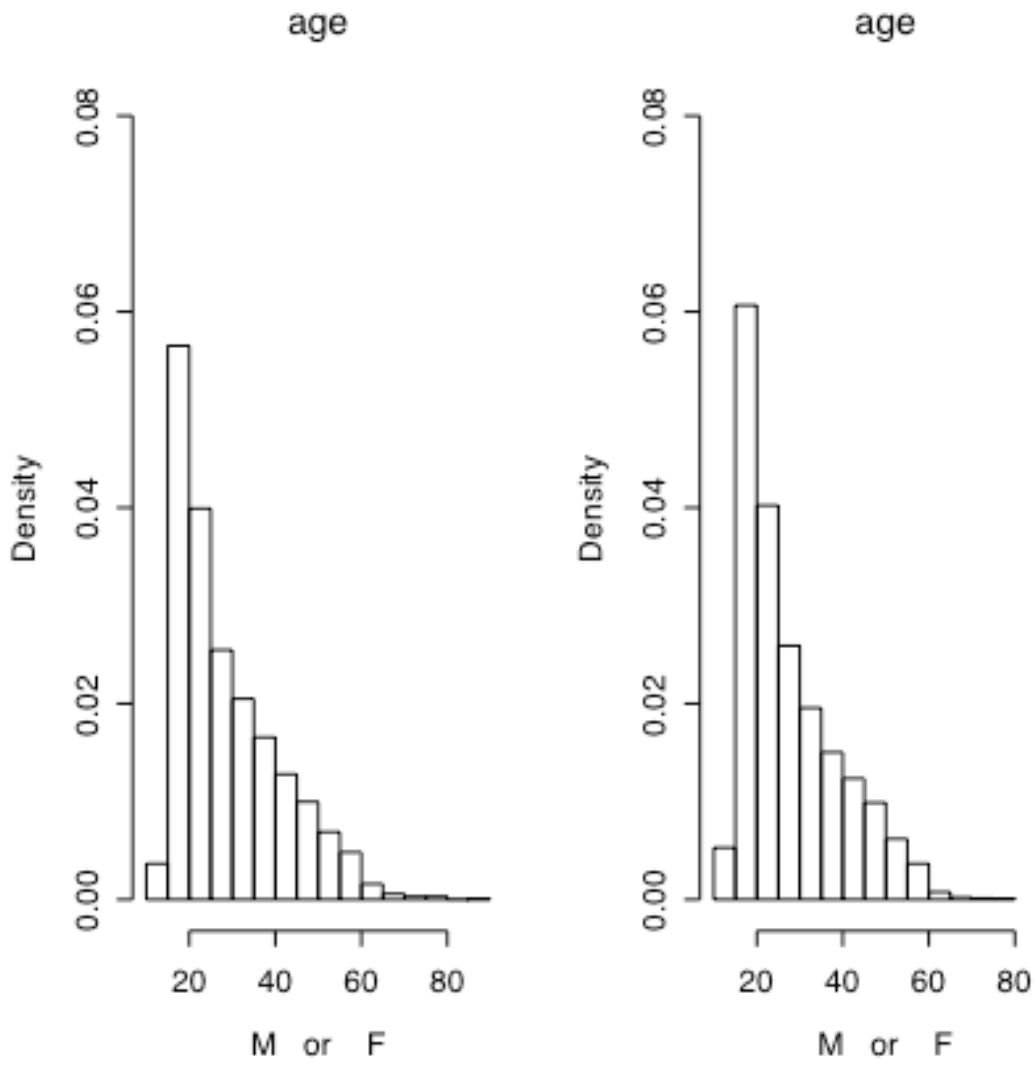


Basic data characteristics

- N of partially cleaned data = 10,282
- N of final cleaned data = 10,260
- Gender =63% female
- Age Males Females
  - Min 11 11
  - 1st q 20 19
  - Median 25 25
  - 3rd Q 36 35
  - Max 87 80

Age by gender

M F



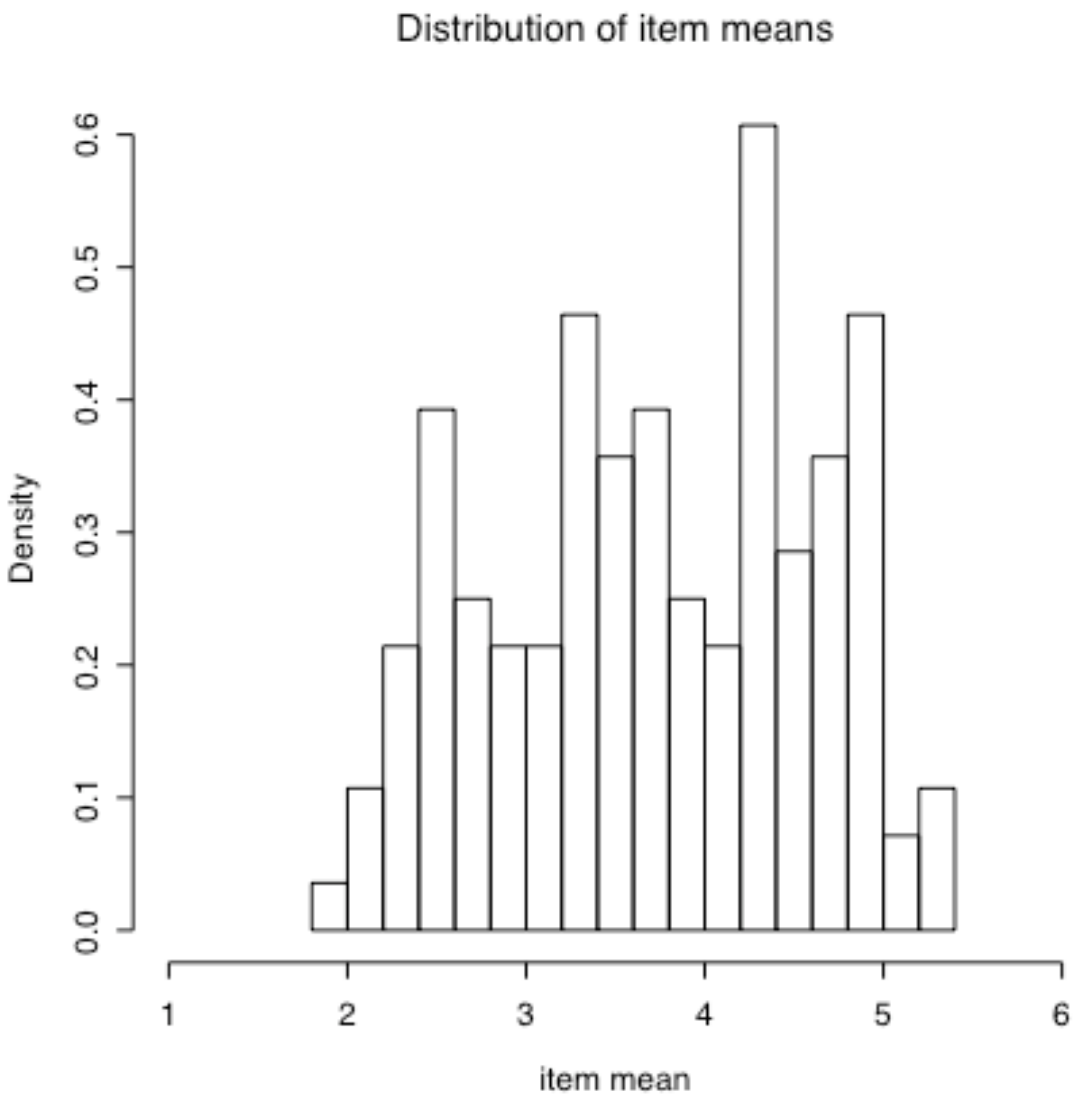
Countries > .5% of sample represent 90% of total

USA	6874	Thailand	64
Canada	584	Norway	61
UK	523	NewZealand	60
Australia	329	Netherlands	58
India	266	Ireland	56
Philippines	106	China	55
Singapore	70	Germany	54
SouthAfrica	65	HongKong	50

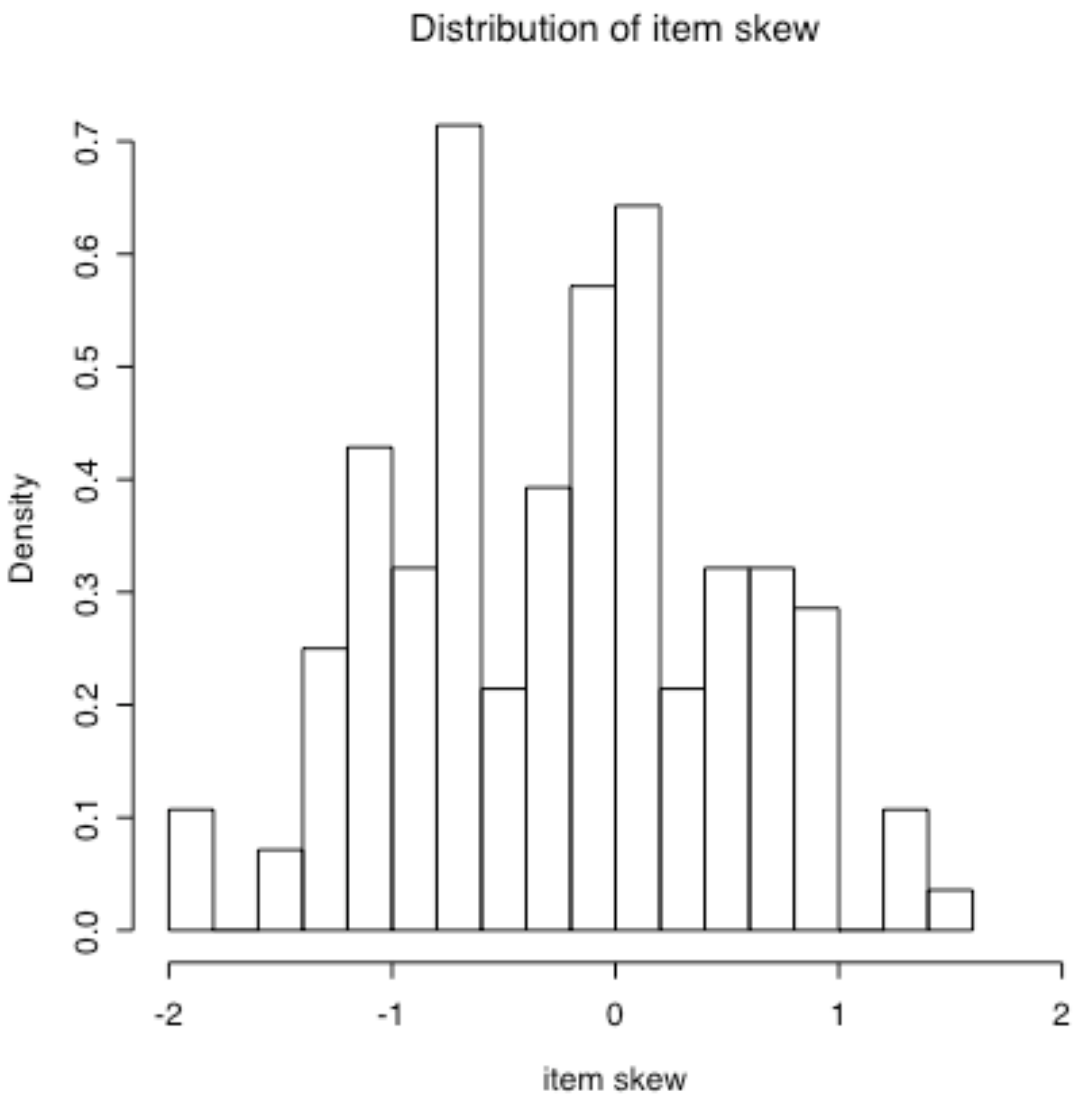
Items given (so far)

- 120 from IPIP
  - 100 IPIP: Big 5
  - 20 IPIP: NEO
- 20 Right Wing Authoritarian
- Item response form:
- 1 - 6
- Scores are reported as item averages

Item Means

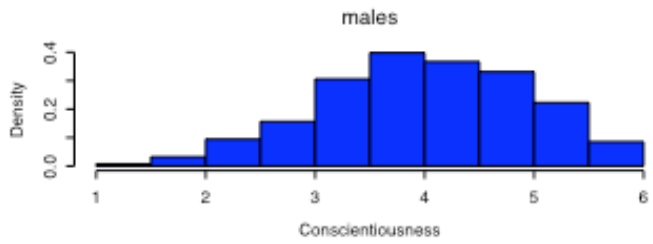

Distribution of item means
Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
1
2
3
4
5
6
item mean

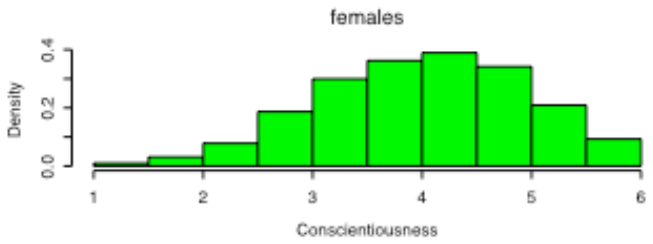
Item Skew

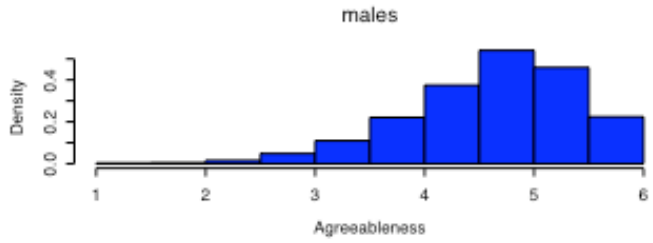

Distribution of item skew
Density
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
-2
-1
0
1
2
item skew

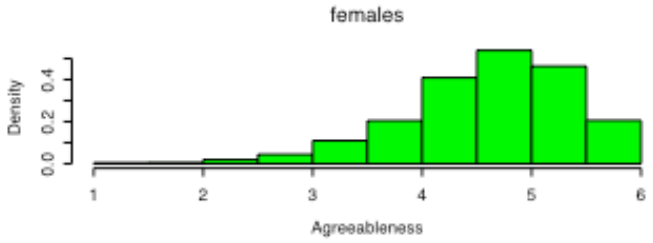
5 item Big 5 scales

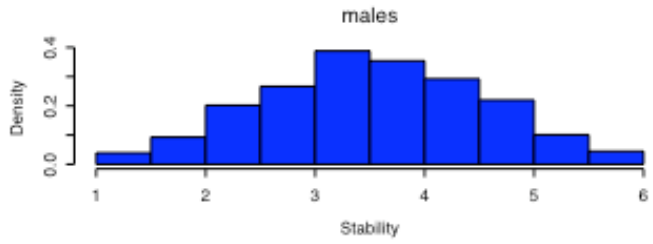
Scale	Mean	S.D.	Average skew	Average Alpha	Average alternate form
C	4.04	1.00	-.24	.58	.73
A	4.65	.84	-.77	.55	.67
N (-)	3.58	1.09	-.00	.61	.73
O	4.60	.81	-.55	.51	.62
E	3.86	1.08	-.26	.62	.78

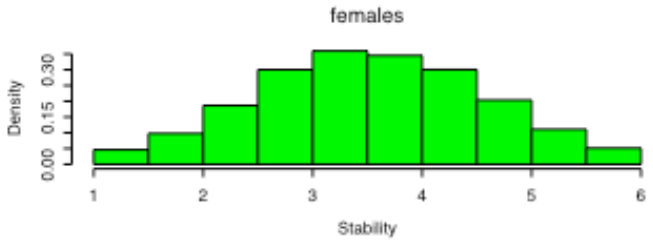

males
Density
0.0
0.2
0.4
1
2
3
4
5
6
Conscientiousness

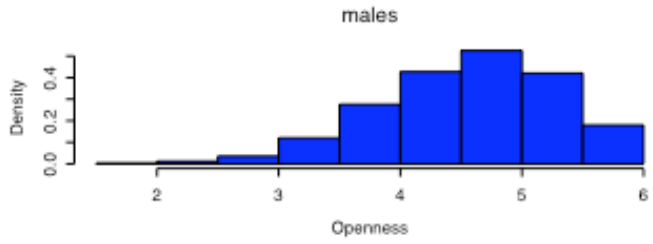

females
Density
0.0
0.2
0.4
1
2
3
4
5
6
Conscientiousness

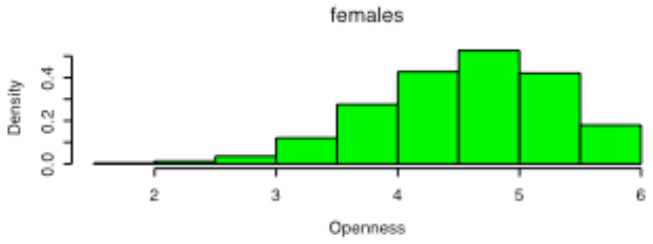

males
Density
0.0
0.2
0.4
1
2
3
4
5
6
Agreeableness

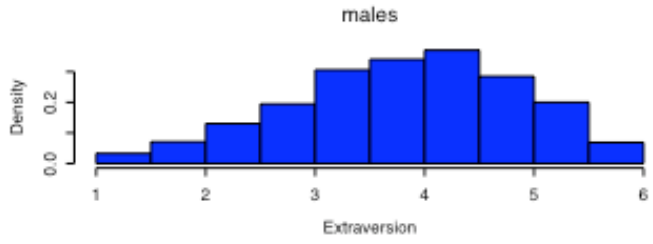

females
Density
0.0
0.2
0.4
1
2
3
4
5
6
Agreeableness

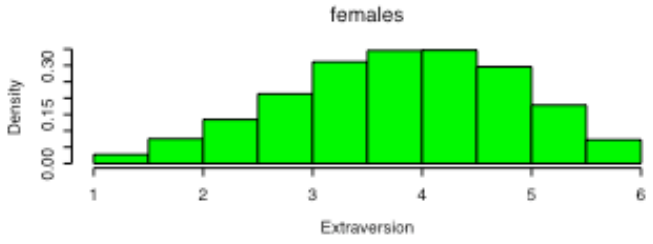

males
Density
0.0
0.2
0.4
1
2
3
4
5
6
Stability


females
Density
0.00
0.15
0.30
1
2
3
4
5
6
Stability


males
Density
0.0
0.2
0.4
2
3
4
5
6
Openness


females
Density
0.0
0.2
0.4
2
3
4
5
6
Openness


males
Density
0.0
0.2
1
2
3
4
5
6
Extraversion


females
Density
0.00
0.15
0.30
1
2
3
4
5
6
Extraversion

Future directions

- Rapid item prototyping
- How does item x relate to standard set?
- How does scale Y relate to scale Z

Example study
Big 5 and Right Wing Authoritarianism

- First 2,500 cases were given 50 Big 5 items + 10 Right Wing Authoritarianism items for a combined pool of 100 Big 5 and 20 RWA
- Results parallel previous results with more conventional sampling techniques

RWA and the Big 5

	Con	Agree	N (-)	Open	Ext
Con					
Agree	.21				
N (-)	.17	.13			
Open	.07	.17	.12		
Ext	.12	.43	.28	.23	
RWA	.23	.03	.00	-.33	.00

Questions and challenges

- Validity of item responses compared to non web surveys
  - Intentional faking
  - Duplicate responding
- Generalizability of subject pool
  - Age
  - Gender
  - Nationality

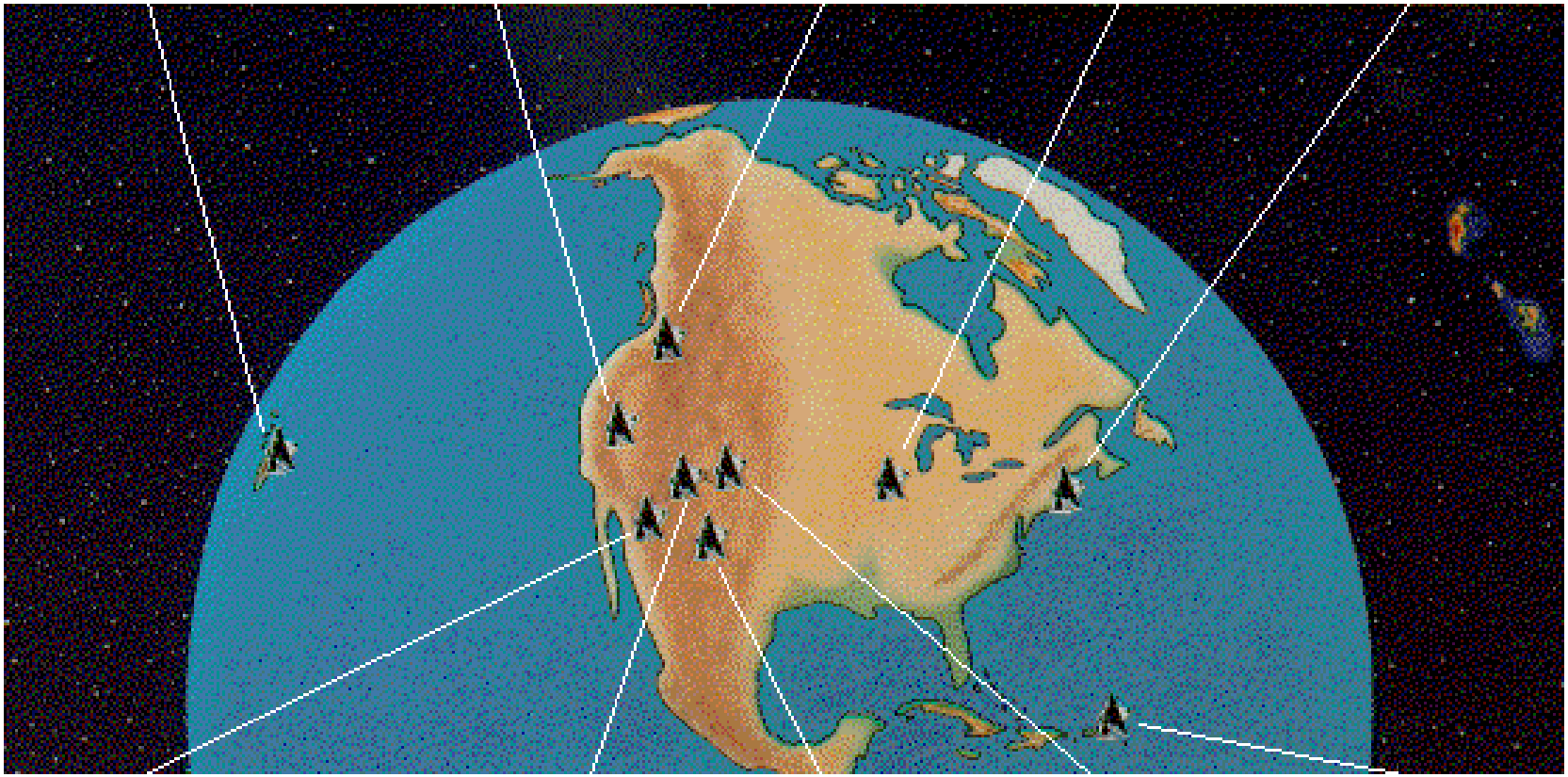
A proposal

Continuing the analogy of radio astronomy and personality assessment, it is appropriate to suggest the formation of a collaboratory of personality assessment.

Very Long Base Line Arrays

- Images from multiple, independent observatories may be synthesized into one image.
- Currently, the VBLA collects data from sites ranging from Mona Kea to New Mexico, to the Virgin Islands, to New Hampshire

The Very Long Base Line Array



A proposal to generalize SAPA to become Very Large Assessment

- Shared item pool: IPIP
  - ipip.ori.org
  - Other public domain item sets?
- Pooled item scores -- available through web
  - e.g., test.personality-project/sapa
- Statistical program code and analyses to be web available (analyses in R)

Resources

- International Personality Item Pool- a research collaboratory (Goldberg)
  - ipip.ori.org
  - Other public domain items?
- Synthetic aperture personality assessment (SAPA)
  - Test.personality-project.org (presents survey)
  - test.personality-project.org/sapa (item statistics and description)
- Web based personality feedback
  - John Johnson