RESEARCH CENTER FOR
EXAMINATIONS EN CERTIFICATIONS

Item Selection Methods based on Multiple Objective Approaches for Classification of Respondents into Multiple Levels

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now you know

Current Study

Is it possible to develop new item selection methods which take advantage of the fact that we want to classify into multiple categories?

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Classification Testing

- Classification into one of several, mutually exclusive categories

Wald, 1947; Eggen & Straetmans, 2000

Item Selection Methods

- Selecting the (next) item based on some criterion
- Objective:

  Maximization of Fisher information at some point on the ability scale

Item Selection Methods

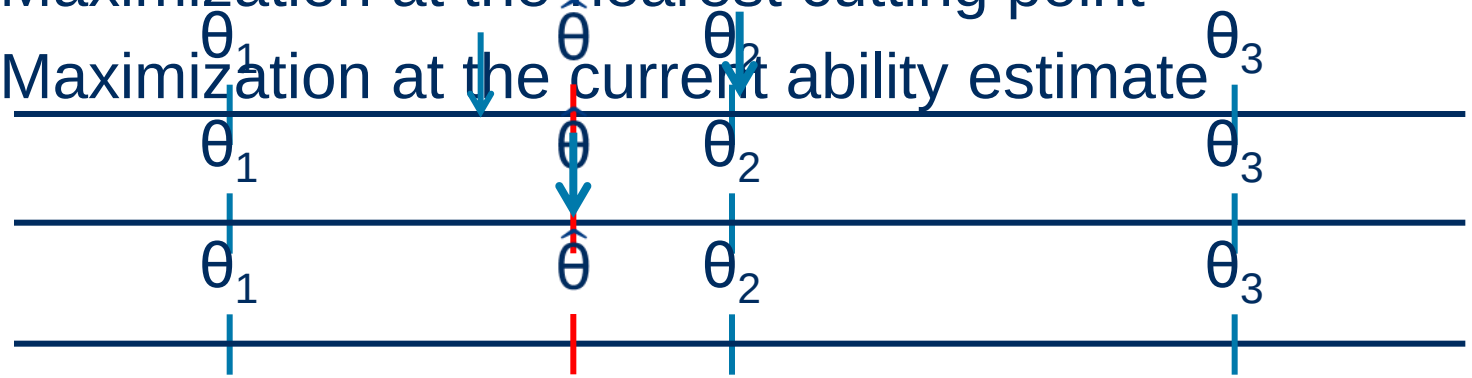
Sequential Classification Testing

Adaptive Classification Testing

Item Selection Methods

Current methods (Eggen & Straetmans, 2000)

- Randomization
- Maximization at the middle of the cutting points
- Maximization at the nearest cutting point
- Maximization at the current ability estimate



Item Selection Methods

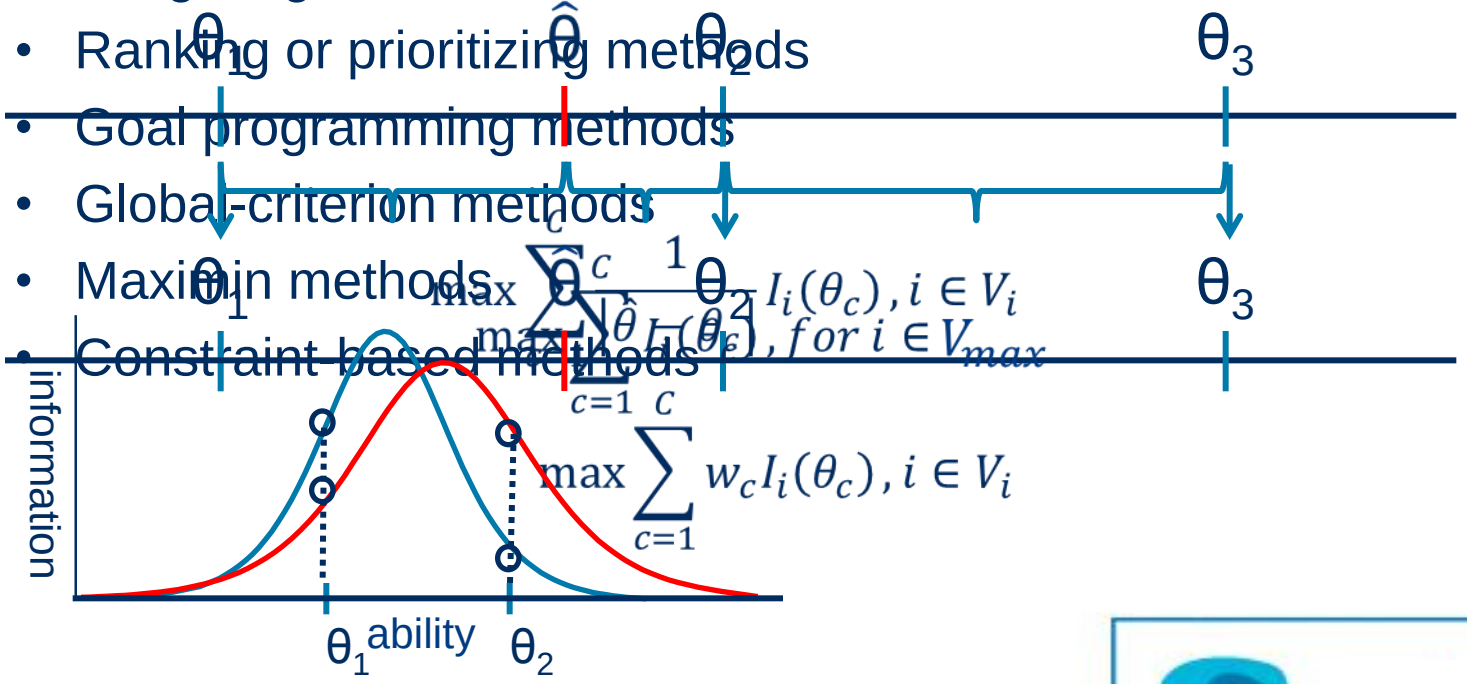
New methods

- Taking multiple points on the ability scale into account
- Based on multiple objective approaches (Veldkamp, 1999)

Item Selection Methods

New methods

- Multiple objective approaches
  - Weighting methods
  - Ranking or prioritizing methods
  - Goal programming methods
  - Global-criterion methods
  - Maximin methods
  - Constraint based methods



Simulation Study

Two item pools:

- 500 items
- α ~N(1.0,0.25)
- β ~N(0.0,1.0) & β ~N(0.0,2.0)

Simulees:

- 1000 simulees per item selection method, θ ~N(0.0,1.0)

SPRT:

- α=β=0.05
- δ=0.10
- Cutting points: -1.0 & 1.0

8 item selection methods

Simulation Study: Results

Item selection method	Broad item pool		Peaked item pool	
	ATL	PCD	ATL	PCD
Random	99.0	0.77	95.6	0.77
Estimate Based	77.1	0.88	74.5	0.89
Middle cutting points	78.6	0.89	76.6	0.87
Nearest cutting point	80.5	0.86	75.0	0.89
Weighting method	79.3	0.87	74.4	0.89
Goal programming method	82.3	0.87	79.9	0.86
Global-criterion method	86.0	0.85	83.1	0.85
Maximin method	85.6	0.85	82.9	0.84

Note: ATL = average test length, PCD = percentage of correct decisions.

Conclusion

- Sequential Classification Tests higher ATL than Adaptive Classification Tests
- Sequential Classification Tests slightly lower PCD than Adaptive Classification Tests
- Results also hold with three and four cutting points

Conclusion

Concluding remarks:

- Other item pools
- Other SPRT settings
- Other ability distributions
- Lower maximum number of items
- High average test length
- Other methods can be based on multiple objective approaches