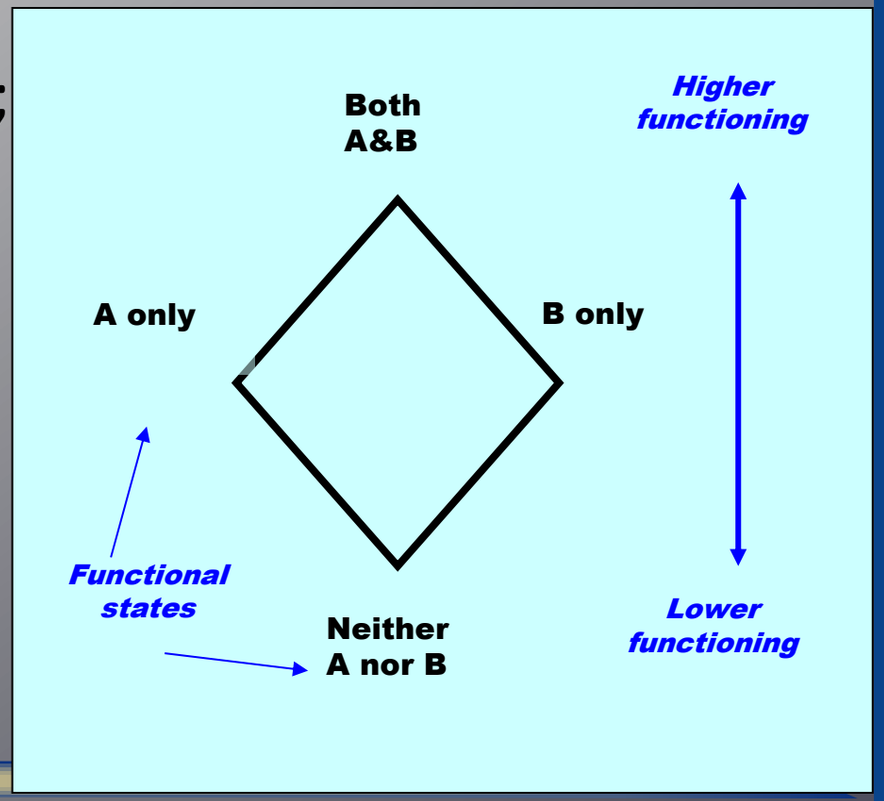
Curtis Tatsuoka, Case Western Reserve University

- Cognitively diagnostic models are based on attribute (skill) mastery profiles, which can provide precise information about learning strengths and weaknesses
- Can provide rich information beyond latent trait models (e.g. IRT score)
- Flexible and broadly applicable: can be applied across subject areas and target populations
- Adaptive testing: can be fast and accurate in CDMs, faster rates of convergence than in IRT; these rates depend on model complexity
- Neuropsychological assessment: analogous statistical setting
- Understanding of theoretical properties of CDMs gives clarity on capabilities and limitations



- Number of attributes that can be modeled is limited by number of items that can practically be administered
- Models grow in size exponentially in relation to the number of attributes
- They keep changing depending on age groups and student population, so may need many models even for same set of items
- Deciding on attributes is very hard work, as attributes must parsimoniously describe item response performance while being detailed enough to be succinct and useful
- Confounding of attribute profiles systematically arises, which means that certain profiles may not be distinguishable given an item pool
- Items and item pools thus need serious design considerations in order for classification performance of students to be accurate
- Methodological “Wild West”: lots of proposed CDM methods have no theoretical support: lots of “over- modeling” in relation to information available in the response data (e.g. 1’s and 0’s), ignoring of key technical issues such as confounding
- Need for careful model fit and validation
- In sum, while CDM models are promising and can provide precise detail on cognitive processes in learning, they are painstaking to develop, and a particular model may have limited scope in terms of target populations