

Proving the Incompatibility of Efficiency and Strategyproofness via SMT Solving

IJCAI 2016

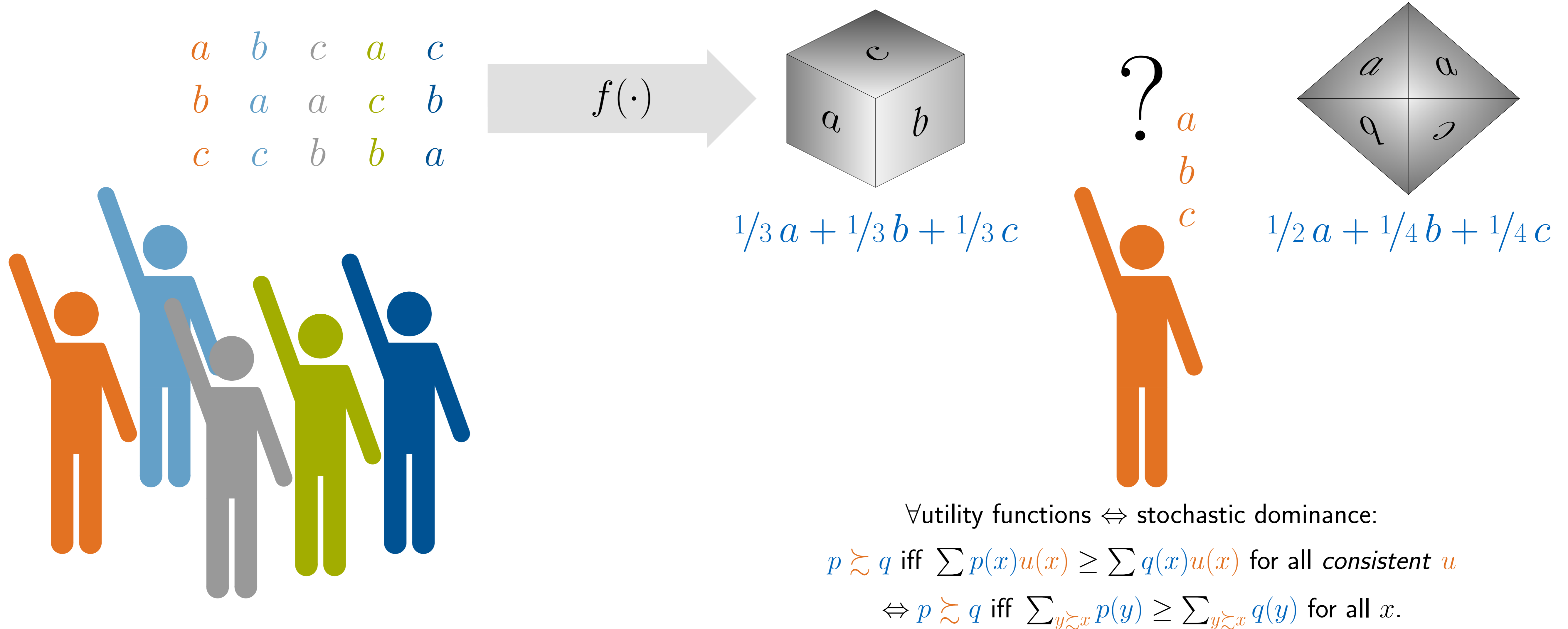
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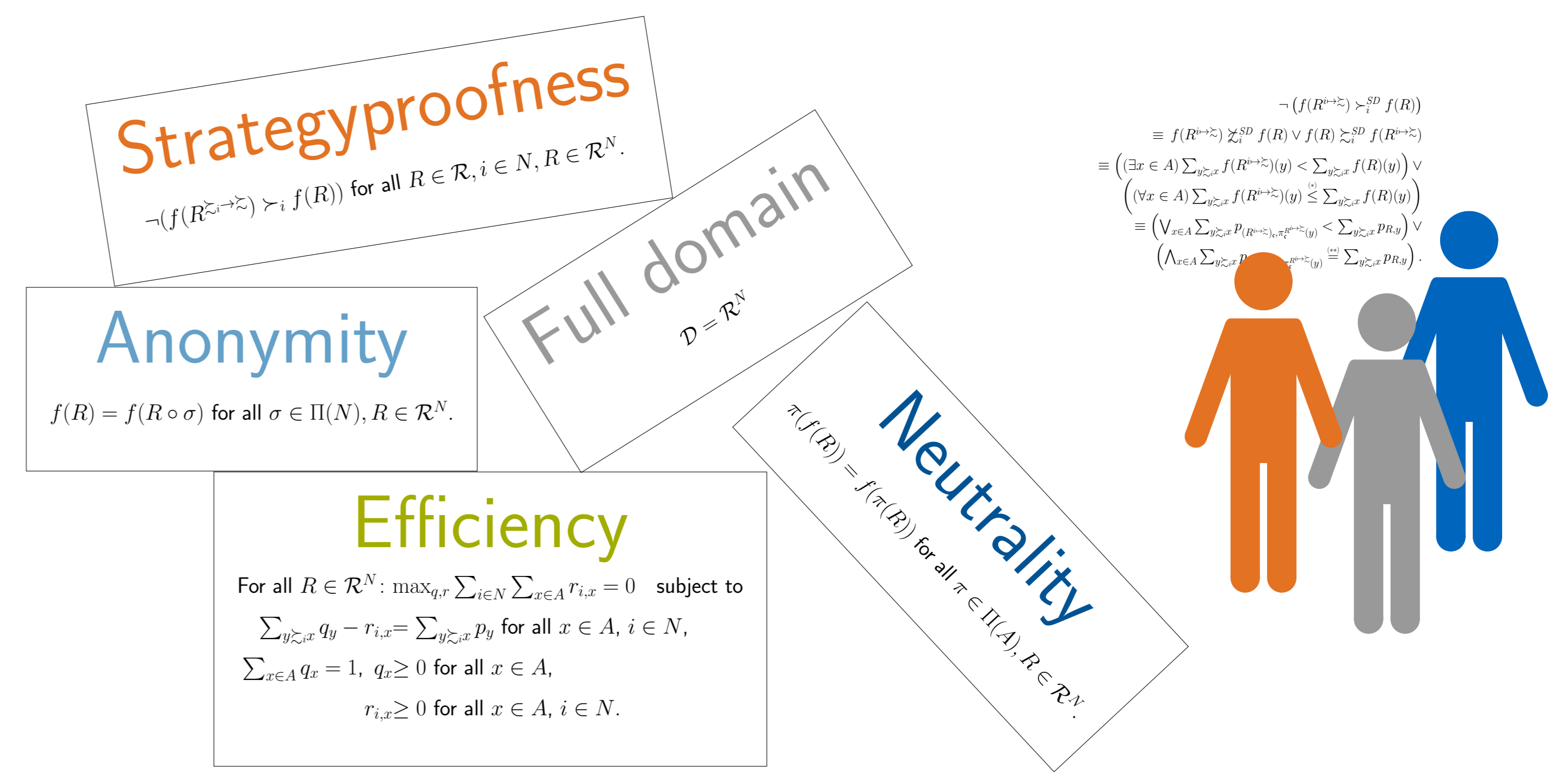
Manuel Eberl

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Efficiency

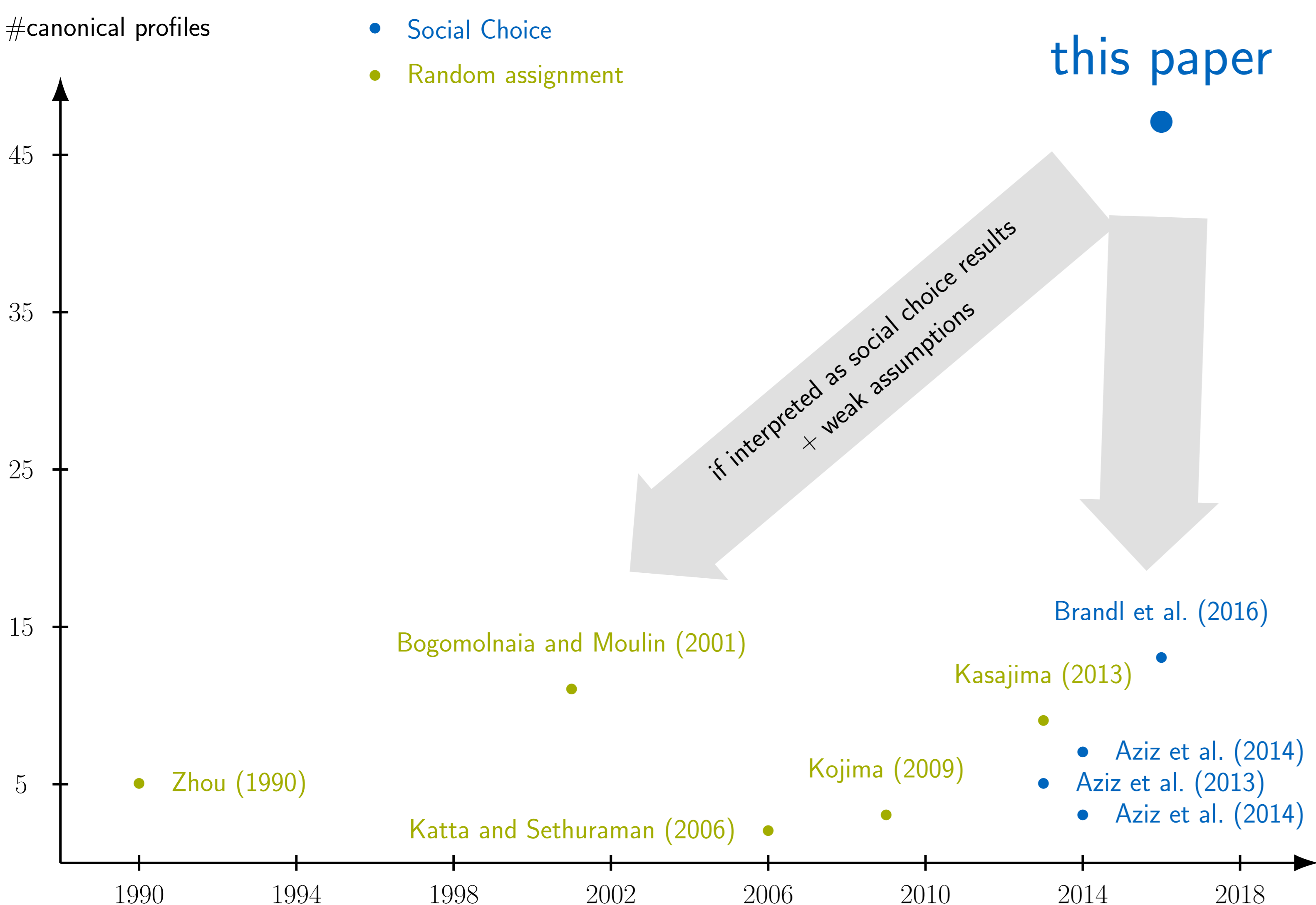
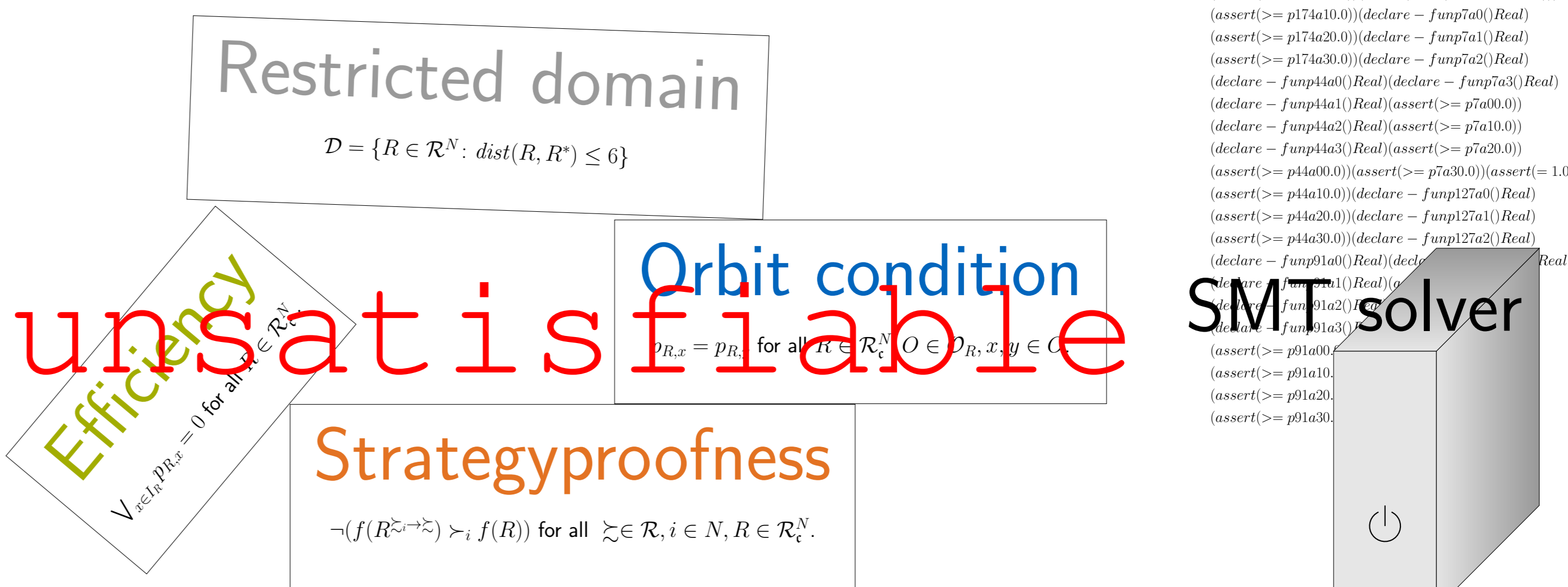
	1	2	3	4	
$1/2$	a, c	b, d	a, d	b, c	$1/2$
$1/4$	b	a	b	a	$1/2$
$1/4$	d	c	c	d	0
	$1/2a + 1/2b$				
	γ_i				
	$1/4a + 1/4b + 1/4c + 1/4d$				\rightarrow inefficient!



Strategyproofness

	1	2
a	a	c
b	b	d
d	c	a
c	d	b
a	γ_1	$1/2a + 1/2c$

\rightarrow manipulable!



Isabelle/HOL

```

local sds impossibili
  "pat (sds R) a + pat (sds R) b
  anonymous sds agents alts sds +
  neutral sds agents alts sds +
  sd efficient sds agents alts sds +
  subsection "openDefinition of Preference Profile"
  by (auto simp add: alts)
  strategyproof sds agents alts sds
  for agents :: "agent set" and alts :: "alt set"
  assumes agents ge 4: "card agents <= 4"
  and alts ge 4: "card alts <= 4"
  begin
  lemma sds: "an sds agents alts sds" by unfold local
  lemma ex post efficient sds: "ex post efficient sds agents alts sds" by unfold local
  lemma sds strategyproof an sds: "strategyproof an sds agents alts sds" by unfold local
  lemma distinct agents: [simp]
  using distinct agents by auto
  "A1 \<not>= A2" "A1 \<not>= A3" "A1 \<not>= A4"
  "A2 \<not>= A1" "A2 \<not>= A3" "A2 \<not>= A4"
  
```