UNIVERSITÉ DE NEUCHÂTEL
Institut de sociologie

12th International Workshop on Partial Orders in Applied Sciences

Towards an Understanding of Complex Phenomenon:
Applying Partial Order Theory to Multi-Indicator Systems

An attempt to explore survival strategies of African trees and bushes in two different landscapes by partial ordering techniques

HAW HAMBURG

Ulfia A. Lenfers[a] and Rainer Bruggemann
[a]Hamburg University of Applied Sciences, Berliner Tor 7,
20099 Hamburg, Germany
ulfia.lenfers@haw-hamburg.de

Overview

- Research question
- Savanna
  - Data
  - Results
- Karoo
  - Data
  - Results
- Discussion

Regions the data are from:


Ecological Informatics

Exploring survival strategies of African Savanna trees by partial ordering techniques

Ulfia A. Lenfers, Rainer Brueggemann, Thomas Clemen

ARTICLE INFO

ABSTRACT

Savanna

Karoo

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An attempt to explore survival strategies of African trees and bushes in two different landscape by partial ordering techniques

Savanna:

Savanna plant community: **Tree**, Shrub, Grass
←→ Grazer, Browser, Fire

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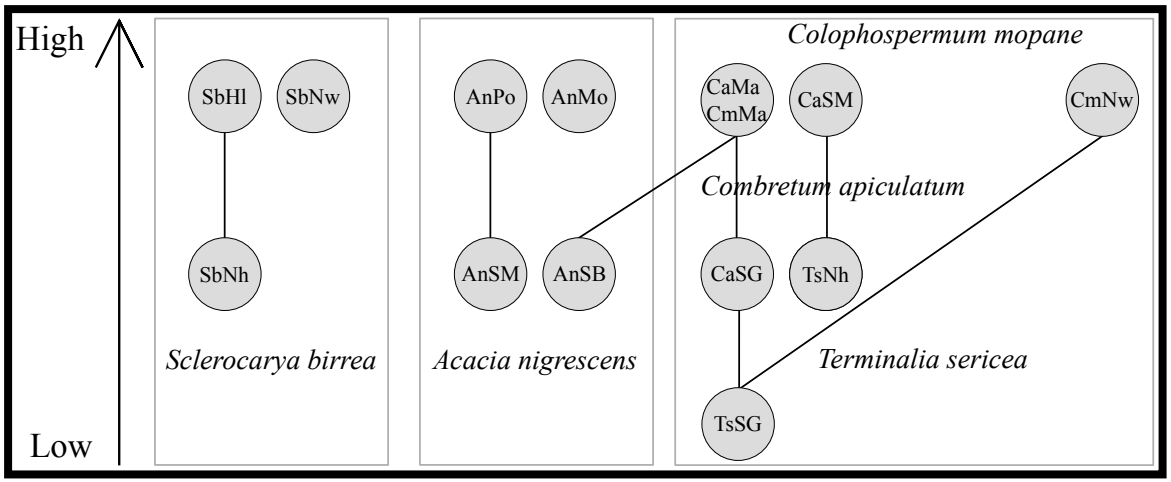
Savanna trees:

Spp	LNC (mg/g)	LCC (mg/g)	LPC (mg/g)	SLA (cm^2/g)	ALA (cm^2) (cm^2)	LDMC (mg/g)	TDMC (mg/g)	LTS (N/mm)	MAP (mm)	MAT $(°C)$	SR (mJ/m^2)
SbHl	18.8	429	1.3	92.72	107.55	339.91	370	1.16	900	20	57
SbNh	10	440	1	70.4	83.3	361.5	372	0.61	678	20	59
SbNw	12.3	452	1	90.46	78.52	336.96	370	0.62	495	22	61
AnMo	23.2	390.1	1.3	111	25.4	638.9	606.8	0.01	550	20	60
AnPo	28.6	424	1.6	112.51	22.39	571.35	607.7	1.51	660	21	54
AnSB	26	421	1	92.7	14.2	475.9	582	0.71	525	21	65
AnSM	26	439	1	88.3	27.5	291.8	538	0.86	676	20	59
CaSG	17	472	1	90.9	20.1	469.2	708	1.16	576	22	65
CaSM	16	489	1	61.6	4.7	669.6	658	1.1	676	20	59
CaMa	19.3	462	1.1	86.22	18.19	408.12	708	1.52	314	22	64
CmMa	22.9	496	1.5	86.07	31.29	437.42	588	1.21	314	22	64
CmNw	18	478	4	46.2	9.3	460.4	588	1.46	495	22	61
TsNh	11	454	1	70.4	14.1	418.7	540	1.02	678	20	59
TsSG	15	461	1	70.7	17.9	429.7	652	0.89	576	22	65

(Benjamin J Wigley et al., 2016)



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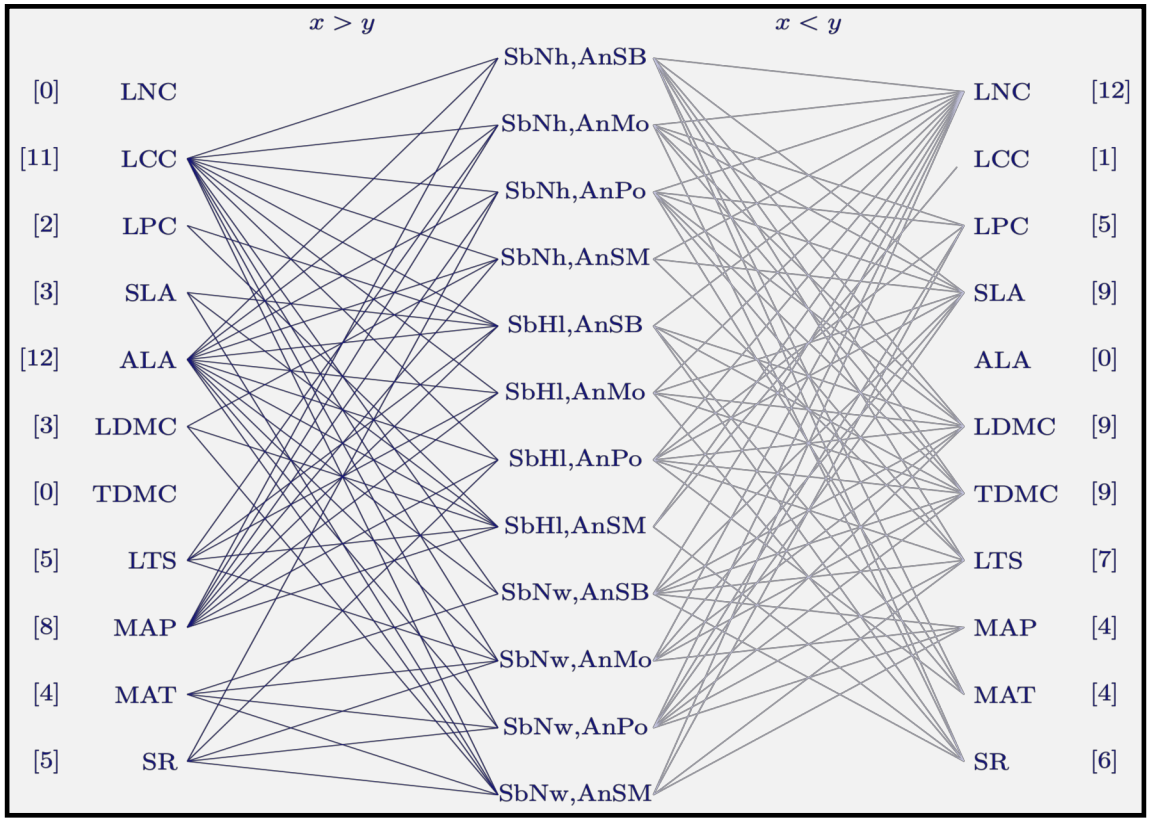
Survival strategies of African Savanna trees



	max	LNC	LCC	LPC	SLA	ALA	LDMC	TDMC	LTS	MAP	MAT	SR
Sb vs An	*12*	0:12	11:1	2:5	3:9	12:0	3:9	3:9	5:7	8:4	4:4	5:6
Sb vs Ca	*9*	2:7	0:9	3:3	2:2	9:0	0:9	0:9	1:7	7:2	1:4	1:7
Sb vs Cm	*6*	1:5	0:6	0:6	2:1	6:0	0:6	0:6	0:6	5:0	0:4	0:5
Sb vs Ts	*6*	3:3	0:6	2:0	4:0	6:0	0:6	0:6	2:4	3:2	1:2	1:4

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Ecological results

Specie	Trait	Strategy
Sclerocarya birrea	high ALA	Early green-up /palatable leaves **Additional nitrogen**
Acacia nigrescens	high LNC	Mycorrhiza/roots **Additional nitrogen**
Colophospermum mopane Combretum apiculatum Terminalis sericea	high LCC	Protection/ Unpalatable leaves **No symbiotic interaction**

Karoo:

Karoo plant community: **Shrub**, Grass
←→ Extensive sheep grazing, Fire, (Temporal springbok)

Eberlanzia ferox
(now *Ruschia intricata*)

Chrysocoma tenuifolia
(now *Chrysocoma ciliate*)

Felicia filifolia

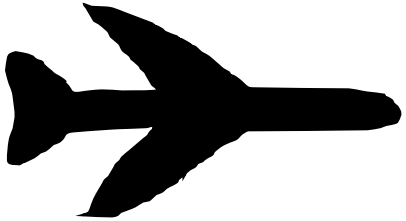
Walafrida saxatilis
(now *Selago saxatilis*)

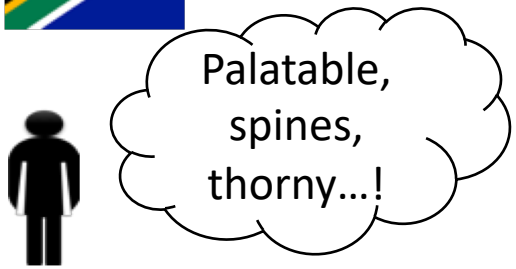
Eriocephalus ericoides

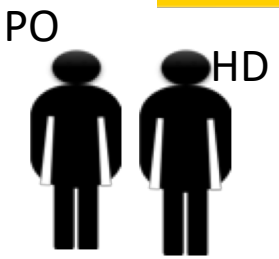
Pentzia spinescens

Photos of all shrubs ©wikipedia

As it was planned







Chrysocoma tenuifolia
unpalatable, no spines
Eberlanzia ferox
CAM pathway leaf-succulent with spines, average palatability
Eriocephalus ericoides
relatively palatable, often dominant, fast-growing non-resprouter, no spines
Felicia filifolia
common, relatively palatable, no spines
Pentzia spinescens
medium-palatable, common
Walafrida saxatilis
unpalatable, common, no spines

How it was:

Code		Winter	Winter	Winter	Winter	Lente	Lente	Lente	Lente	Somer	Somer	Somer	Somer	Herfs	Herfs	Herfs	Herfs
Species	ULRa	Corg	Canorg	P	N	Corg	Canorg	P	N	Corg	Canorg	P	N	Corg	Canorg	P	N
Chrysocoma tenuifolia	16100	7,14	7,24	0,17	1,07	6,1	5,1	0,12	0,88	8,15	7,63	0,11	1,11	7,87	8,58	0,18	1,17
Chrysocoma tenuifolia	16206	8,50	5,58	0,16	0,90	8,67	6,32	0,11	0,75	8,36	6,22	0,09	0,79	10,13	8,07	0,11	0,85
Chrysocoma tenuifolia	13311	3,71	4,65	0,13	1,03	6,03	4,73	0,08	1	5,98	5,07	0,09	0,83	4,47	6,78	0,12	0,77
Chrysocoma tenuifolia	13307	5,05	4,24	0,17	0,87	6,47	4,76	0,08	0,71	4,75	3,85	0,08	0,95	5,05	7,82	0,13	0,92
Eberlanziaferox	26407	3,45	6,31	0,15	0,82	2,93	5,68	0,09	0,78	4,07	7,15	0,09	0,78	3,54	7,22	0,07	0,83
Eberhnziaferox	20403	2,72	8,02	0,16	0,93	2,1	7,45	0,1	0,75	3,01	6,28	0,1	0,8	3,12	6,68	0,12	0,87
Eberlanzia ferox	20100	2,85	5,94	0,18	0,98	2,87	7,18	0,14	0,92	2,86	6,83	0,13	0,98	2,68	5,06	0,12	0,91
Eberlanziaferox	20505	2,88	8,66	0,17	1,02	2,9	8,09	0,11	0,98	3,13	8,28	0,1	1,2	2,41	8,13	0,13	0,99
Eberhnziaferox	20601	3,24	9,01	0,10	0,86	3,04	9,47	0,07	0,73	2,97	9,27	0,08	0,99	2,68	9,17	0,09	0,77
Eberhnziaferox	23707	3,06	7,03	0,41	0,80	3,73	5,29	0,08	0,64	3,35	7,88	0,1	0,75	2,75	5,71	0,1	0,75
Eriocephalus ericoides	30403	2,85	5,60	0,15	0,87	2,52	6,81	0,14	0,81	1,81	3,52	0,1	0,85	2,81	5,69	0,17	0,73
Eriocephalus ericoides	30601	1,77	4,73	0,12	0,81	2,97	6,63	0,11	0,78	2,09	3,55	0,08	0,79	2,23	3,69	0,11	0,83
Eiocephalus ericoides	33707	2,09	8,58	0,18	0,83	2,14	6,93	0,09	0,79	2,05	6,11	0,07	0,76	2,92	9,48	0,08	0,8
Felicia filifulia	40601	1,65	4,09	0,10	0,80	1,43	3,31	0,06	0,72	1,79	3,49	0,08	0,91	1,96	5,55	0,1	1,01
Felicia filifolia	43711	2,59	8,64	0,12	0,91	2,77	6,71	0,09	0,9	2,56	4,26	0,04	0,82	2,07	5,01	0,08	0,83
Pentzia spinescens	56407	2,67	6,91	0,16	0,99	2,13	5,7	0,08	0,98	2,54	5,21	0,11	0,91	3,24	4,69	0,01	0,71
Pentzia spinescens	56100	3,13	9,26	0,21	1,15	2,45	6,58	0,12	1,06	2,83	5,87	0,13	0,94	3,48	8,23	0,12	1,08
Penlzia spinescens	56206	4,01	6,44	0,15	0,50	2,62	6,06	0,1	0,78	3,9	6,94	0,1	0,9	3,37	5,94	0,11	0,84
Pentzia spinescens	56207	3,62	8,73	0,20	1,09	2,43	7,62	0,14	1,03	3,61	5,86	0,13	1,2	2,88	7,04	0,15	1,22
Pentzia spinescew	56505	1,81	4,93	0,19	0,88	2,28	5,01	0,06	1,04	2,91	5,43	0,06	1,06	2,96	5,86	0,11	1,15
Pentzia spincscens	50403	1,82	5,39	0,16	0,89	2,26	6,06	0,1	0,99	1,55	4,11	0,12	0,87	2,3	6,41	0,12	0,96
Pentzia spinescens	50505	1,77	5,01	0,13	0,82	2,53	6,42	0,08	1,17	1,74	7,18	0,08	1,06	2,43	6,53	0,1	1,05
Pentzia spinescens	50601	2,33	7,40	0,11	0,88	2,1	5,63	0,07	0,82	1,97	3,92	0,07	0,74	2,22	5,85	0,08	0,91
Wahfrida saxatilis	63811	4,94	6,19	0,12	0,97	9,81	5,51	0,08	0,89	7,59	5,01	0,06	0,88	6,97	6,43	0,09	0,92
Wahfrida saxatilis	63807	7,27	5,89	0,20	0,96	7,85	7,33	0,1	0,82	7,77	5,1	0,08	0,81	6,76	8,26	0,09	0,96

Data source: Gemiddelde fitomassa en chemiese sarnestelling van 'n aamtal plantspesies in die Groot-Karoo (1990)

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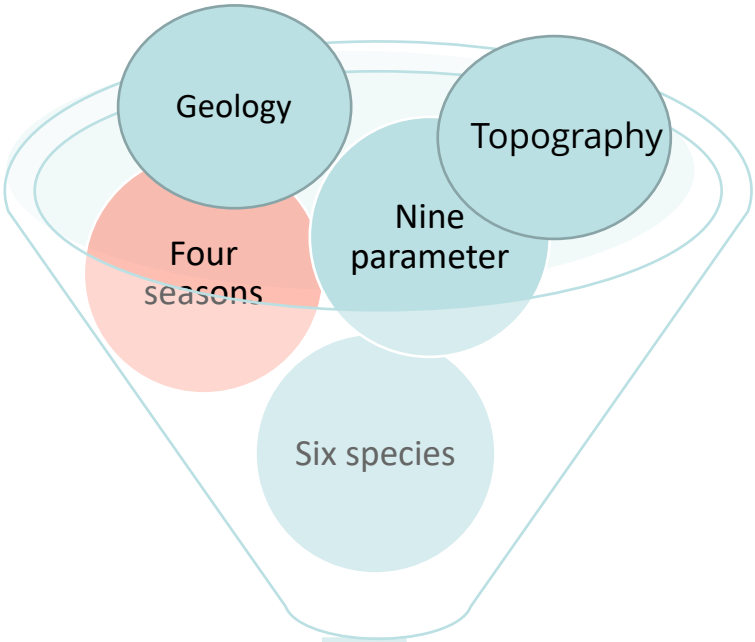
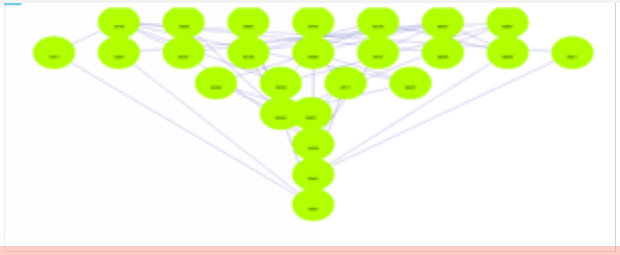
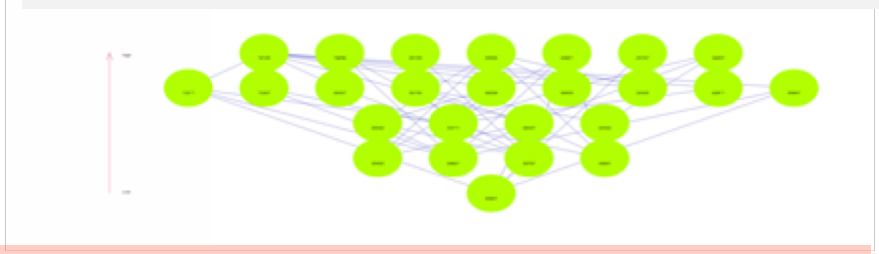
Data – is that enough?



Winter, four parameter, all species



Summer, four parameter, all species



Seasonal levels are not driven by numerical values

Never give up- It´s Partial Order time

Geology

Topography

C
N
P

C org

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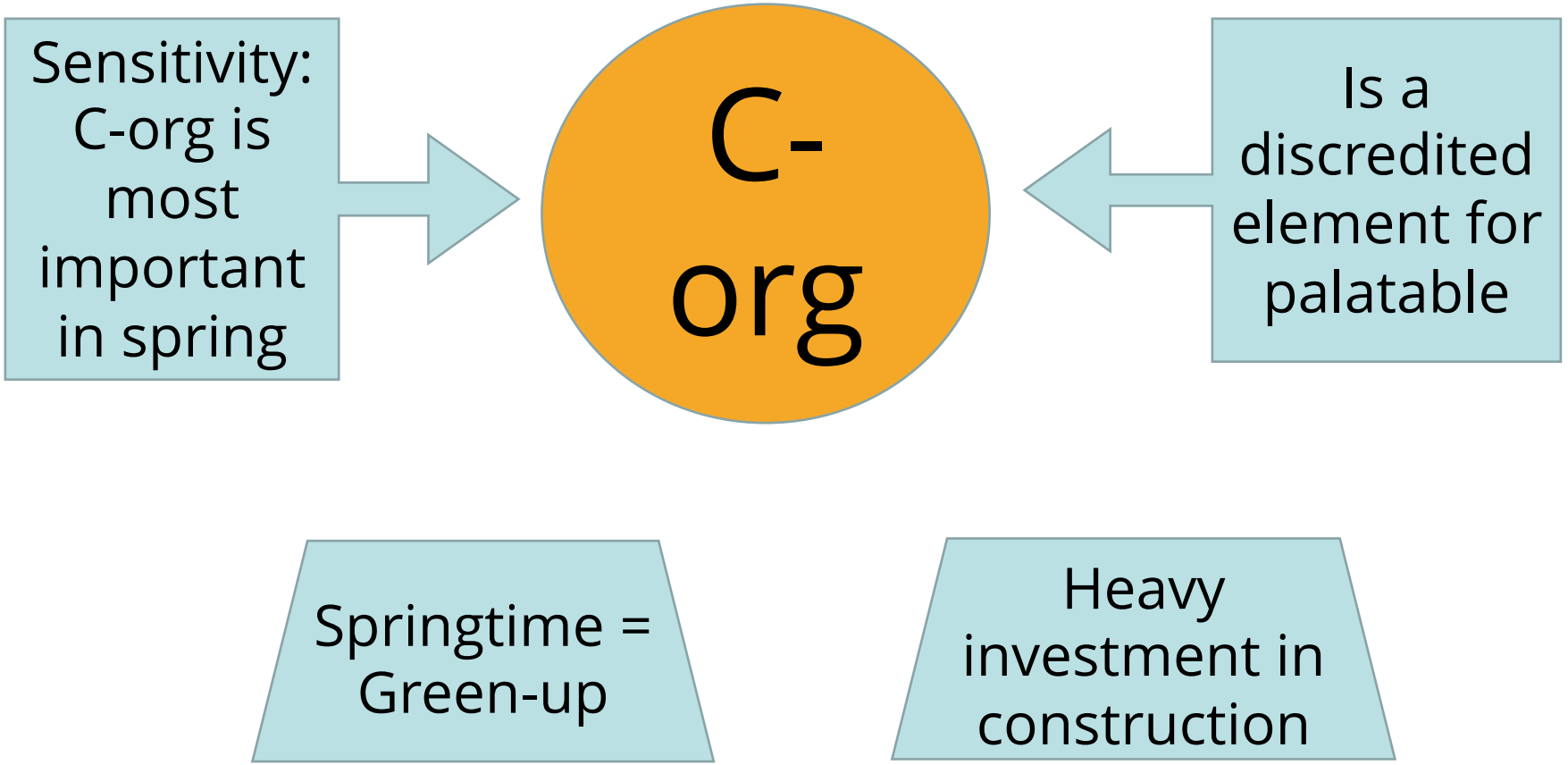
Carbon


Sensitivity: C-org is most important in spring
C-org
Is a discredited element for palatable
Springtime = Green-up
Heavy investment in construction

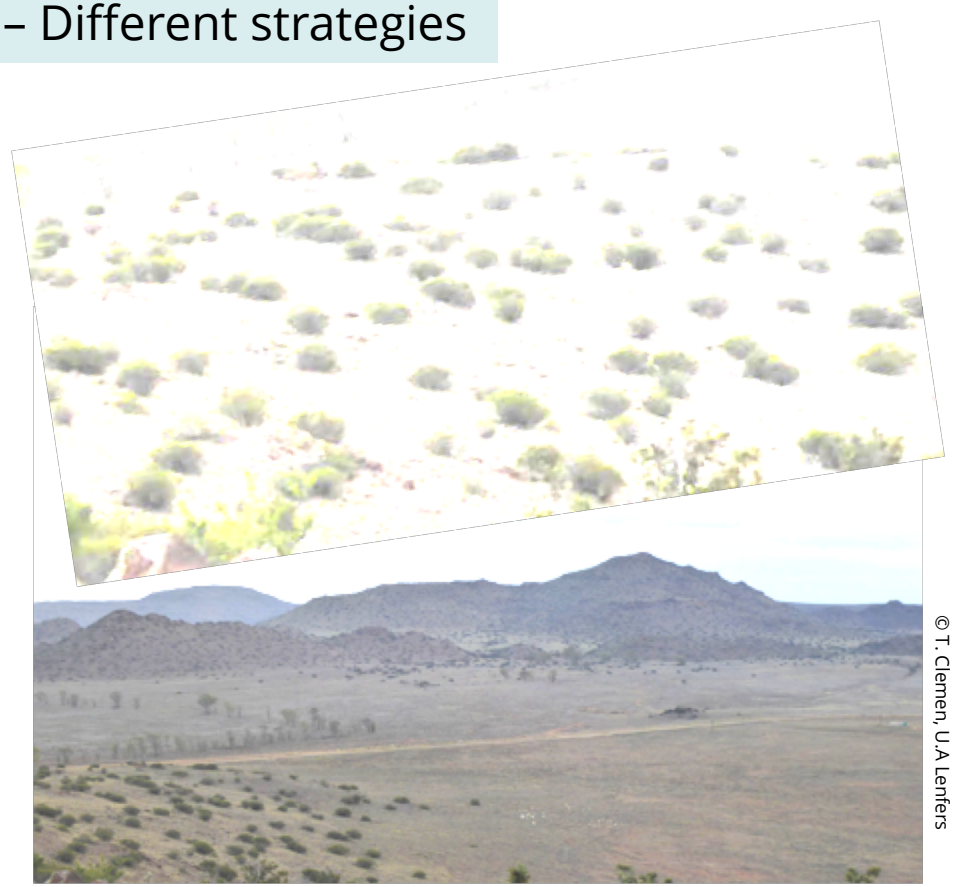
But …

It is not so easy to pay attention to the right things

An attempt to explore survival strategies of African trees and bushes in two different landscape by partial ordering techniques

Savanna trees vs Karoo bushes

Different living conditions – Different strategies



The selection of the data is the most crucial

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Thanks to the MARS team

MARS: *Multi-Agent Research & Simulation:*

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ulfia.lenfers@haw-hamburg.de

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