Bouldering route complexity

CSSS 2023

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MoonBoard bouldering

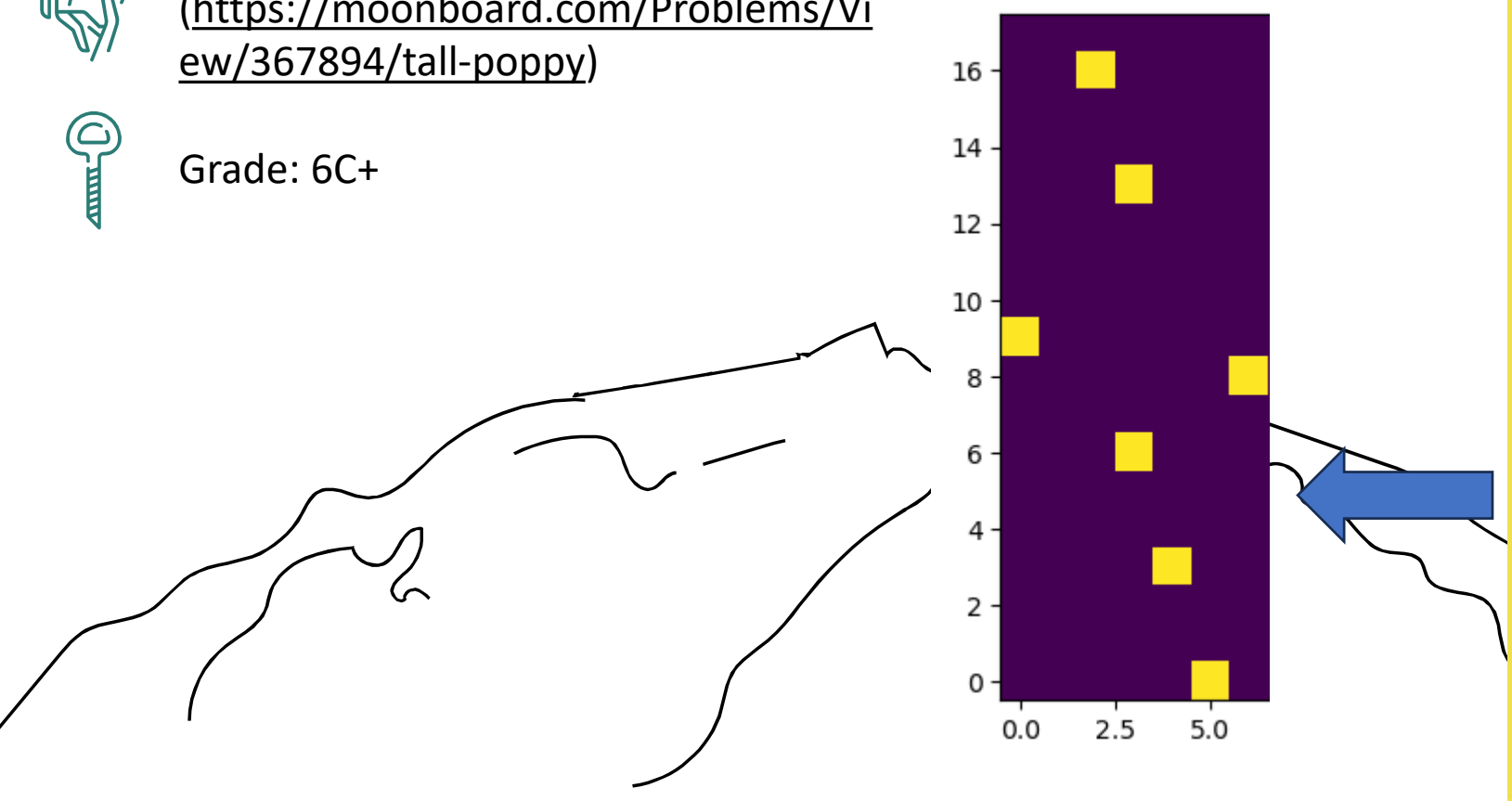
- Standardised bouldering wall, 3 different types
- Sold around the world
- 3,500 USD – 16,000 USD
- Allows users to set and share routes around the world
- 18x11, Unlimited training possibilities

Bouldering route example

Mobile app: open access climbing routes

Example project: Tall Poppy (https://moonboard.com/Problems/View/367894/tall-poppy)

Grade: 6C+

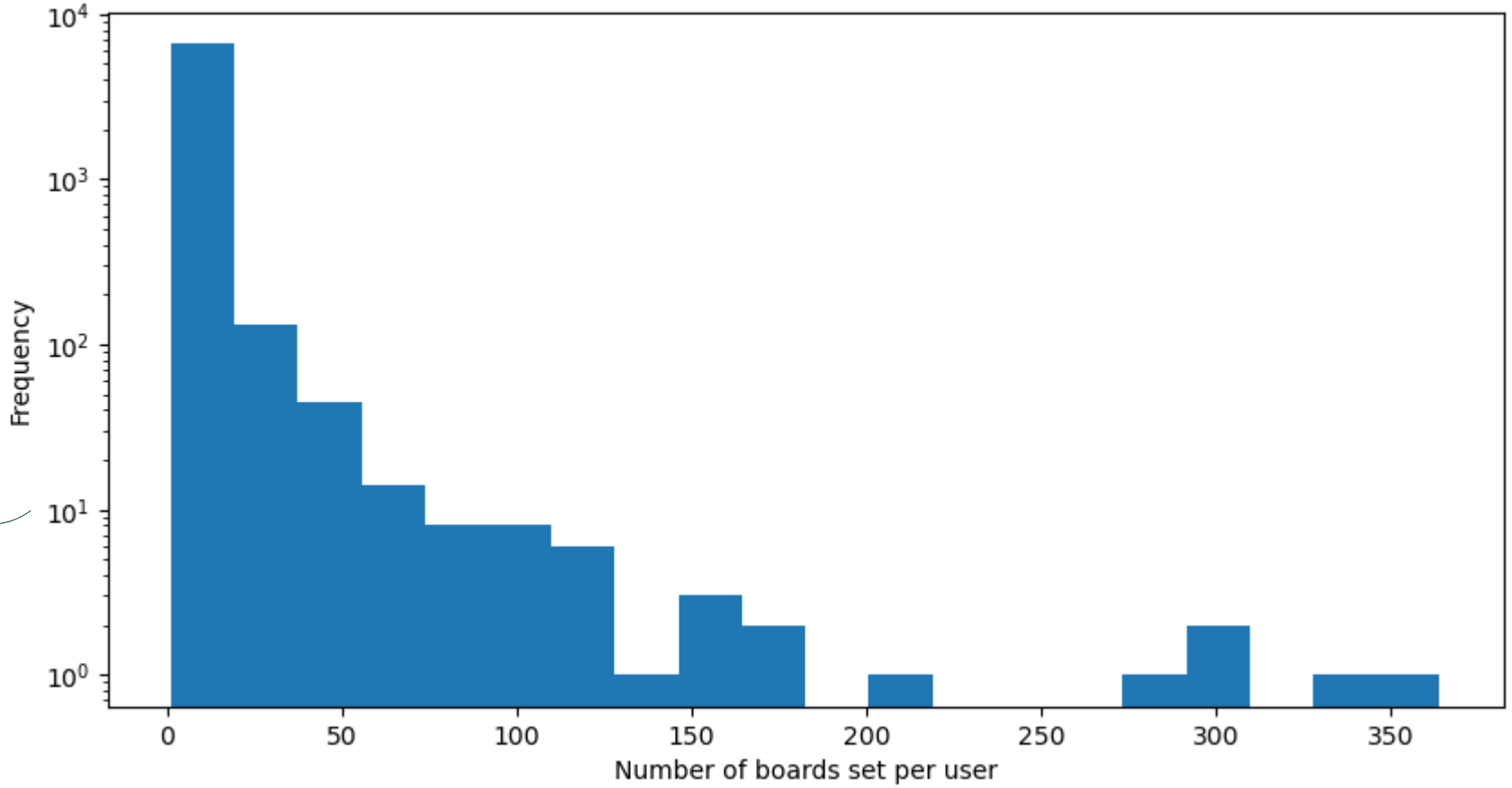


Descriptive statistics on routes and users

30,642 routes

6,815 setters

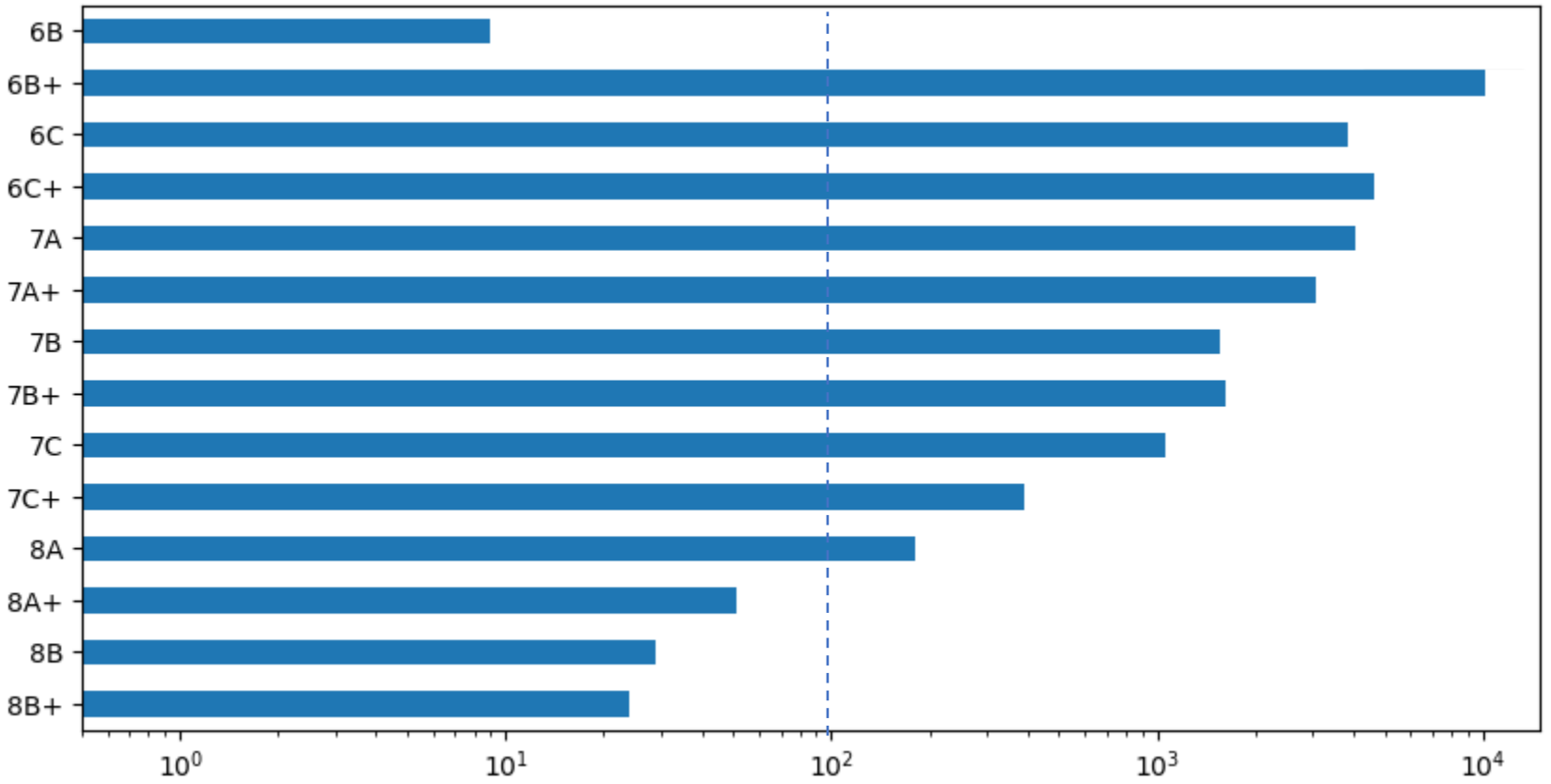
19 users set more than 100 routes each



Descriptive statistics on routes and grades

Grading from 6B to 8B+

Climbing: French	UK	Austr.	UIAA	North America	Bouldering: Hueco
6b		20	VII	5.10c	V1
6b+	E3 5c	21	VII+	5.10d	
6c		21/22	VII+/VIII-	5.11a	V2
6c+	E4 6a	22	VIII-	5.11b	V3
7a		23	VIII	5.11c/d	
7a+	E5 6b	24	VIII/VIII+	5.12a	V4
7b		25	VIII+	5.12b	V5
7b+	E6 6b	26	IX-	5.12c	V6
7c		27	IX	5.12d	
7c+		28	IX/IX+	5.13a	V7
8a	E7 6c	29	IX+	5.13b	V8
8a+		30	X-	5.13c	
8b	E8 7a	31	x	5.13d	V9
8b+		32	X/X+	5.14a	V10

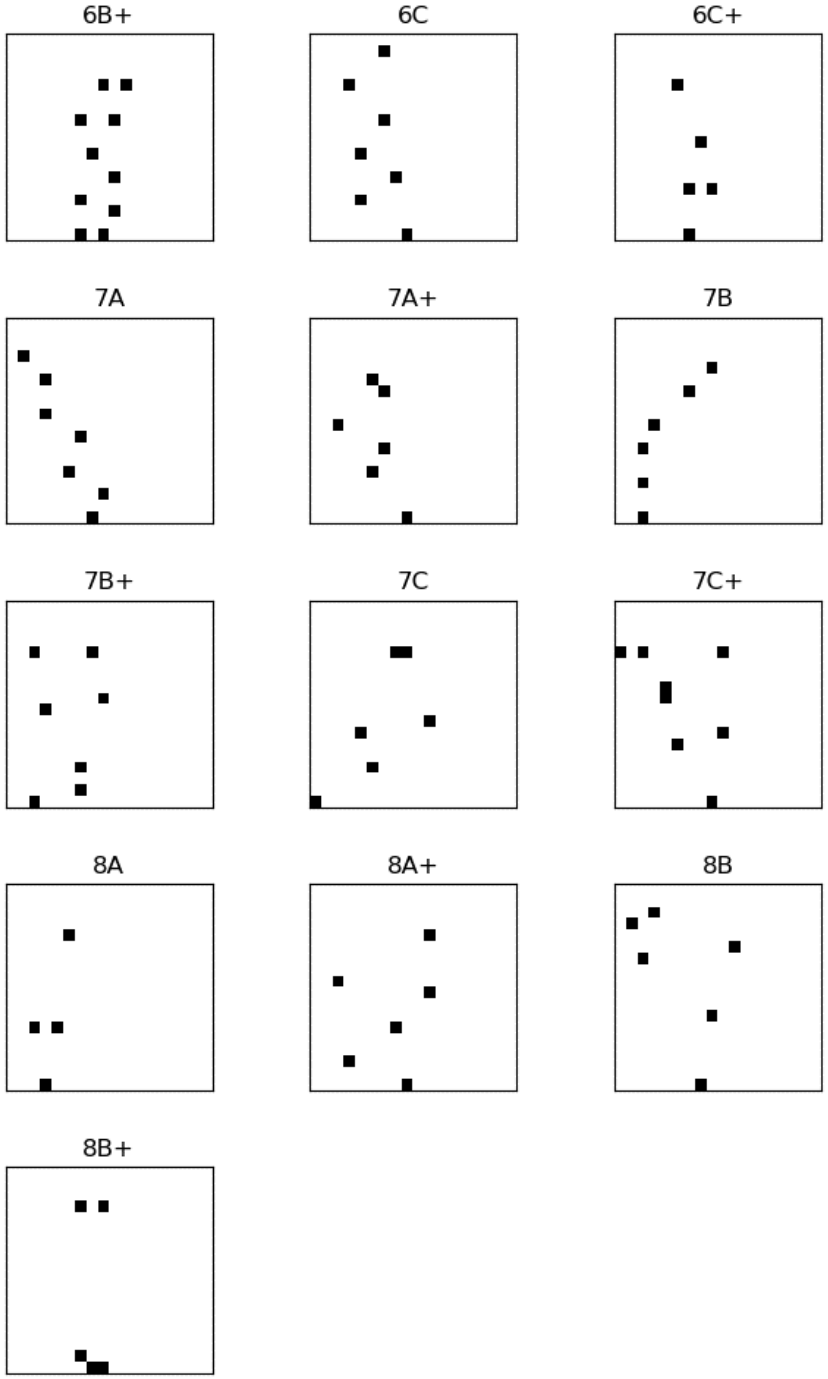


Examples of routes of different difficulty level

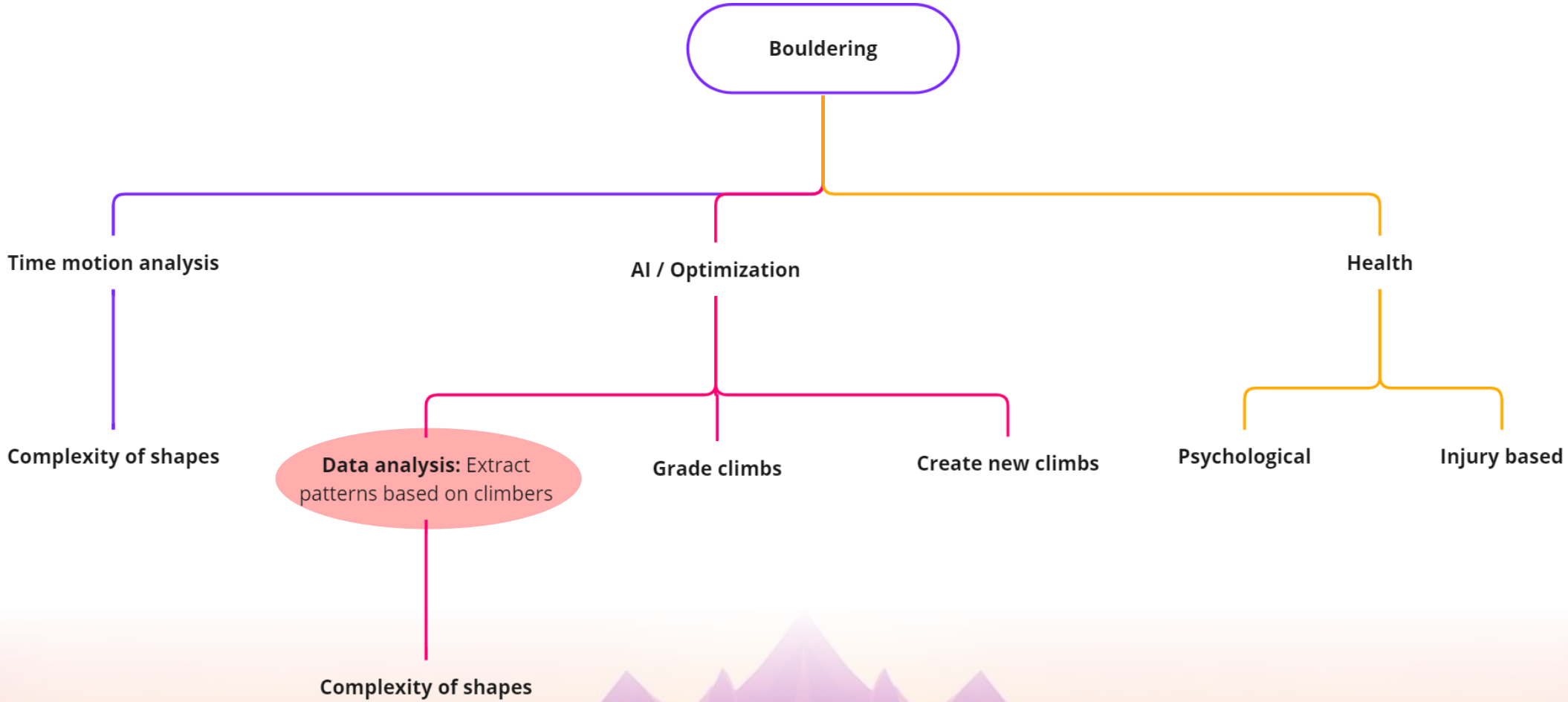
Hypothesis: Routes get more complex over time

Solution: 2 new algorithm

Based on triangles

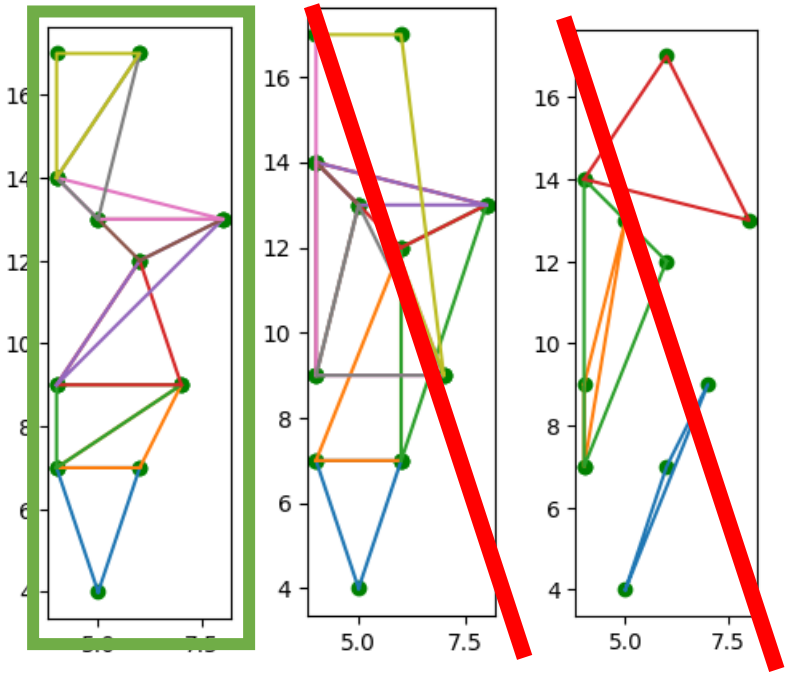


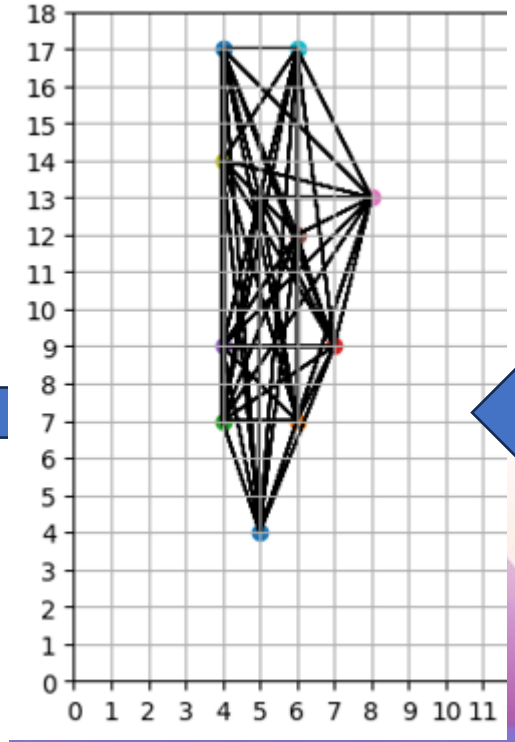
Literature Review



Climb Complexity: The Human Factor in Shaping Climbing Routes

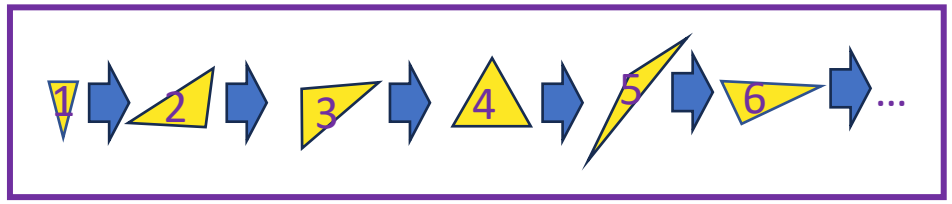
- Create all the possible triangles
- Next move: min distance to next centroid
- At least one common edge

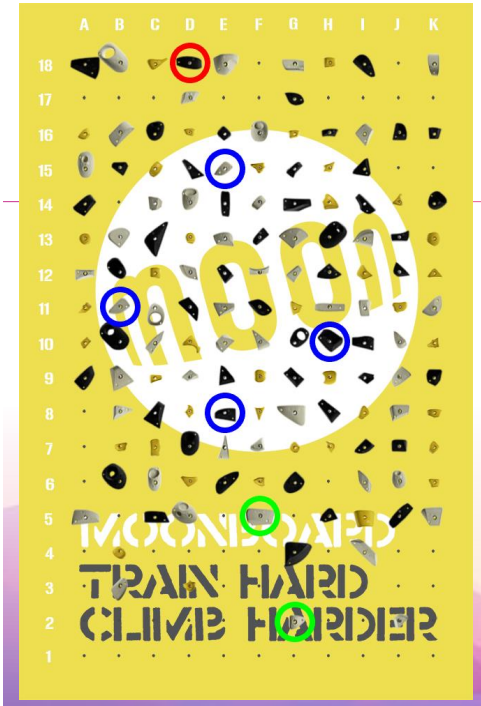


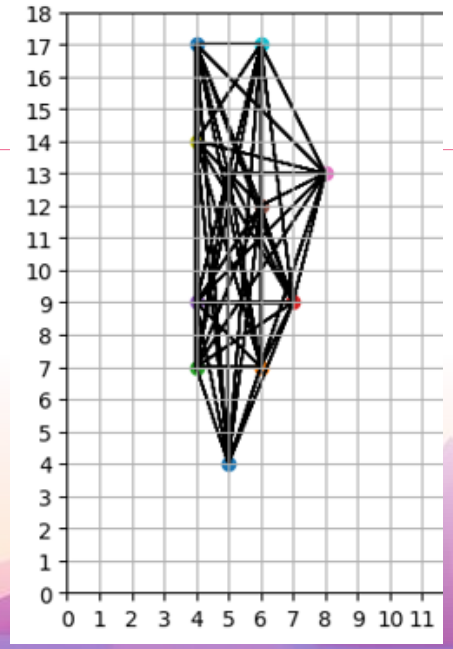


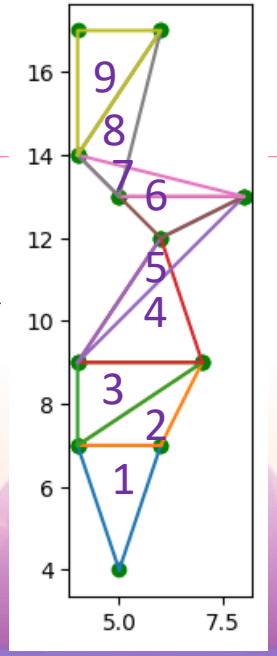
Shapes on the Wall: The Art and Science of Climbing Route Setting

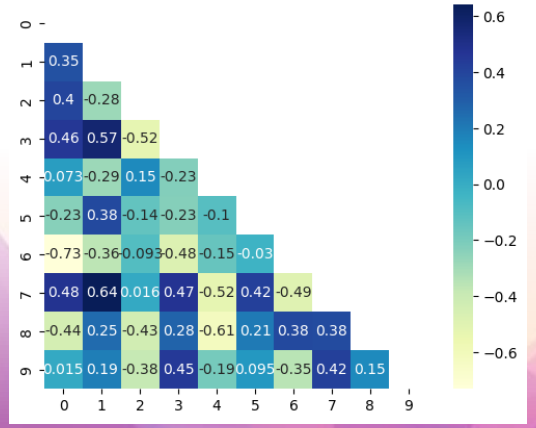
- Different individuals apply their unique perspectives and inventive strategies
- Visual complexity vs the physical complexity

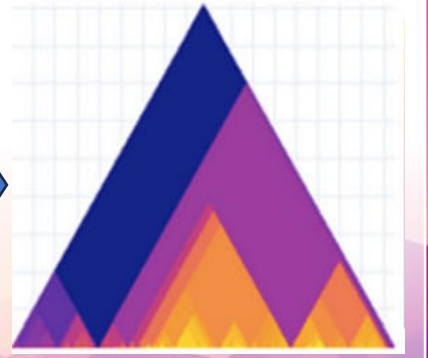












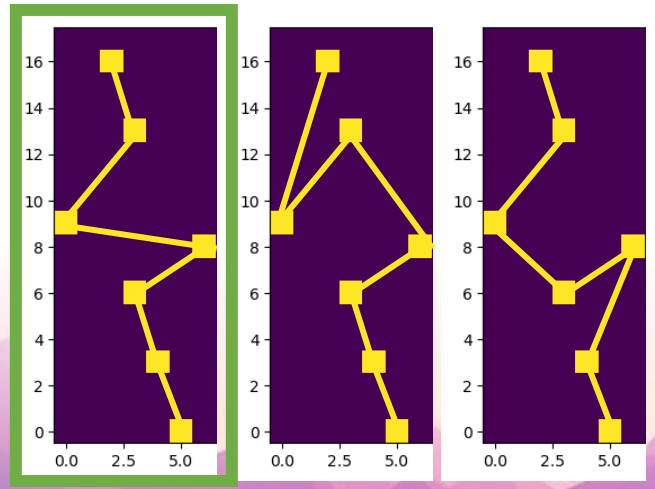
Example heat map of the triangles

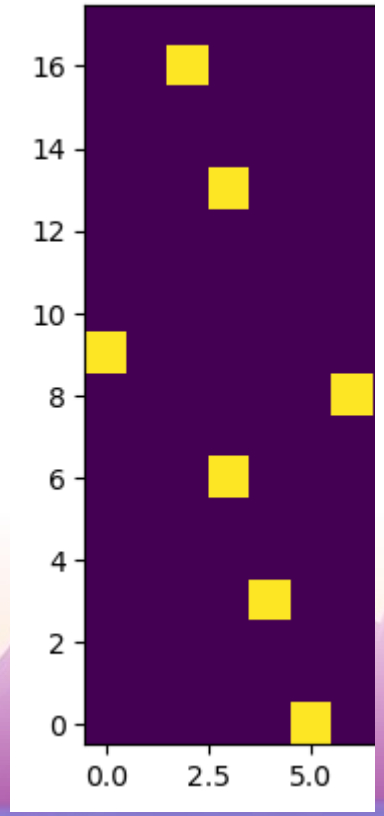
Bouldering route

Example project: Tall Poppy (https://moonboard.com/Problems/View/367894/tall-poppy)

Grade: 6C+

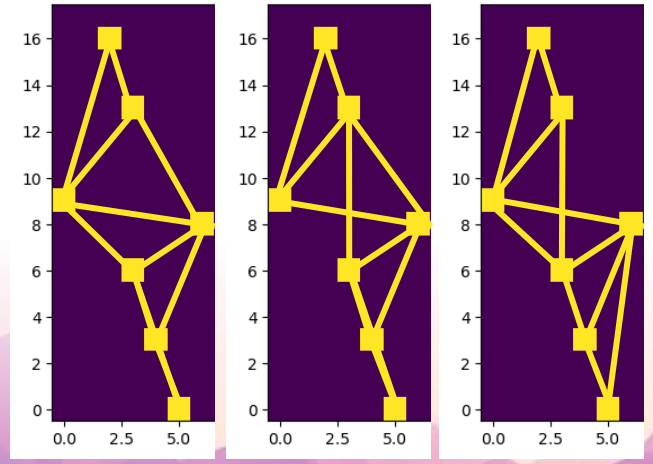
- We infer the route by choosing the shortest distance from start to finish, and allow for variations

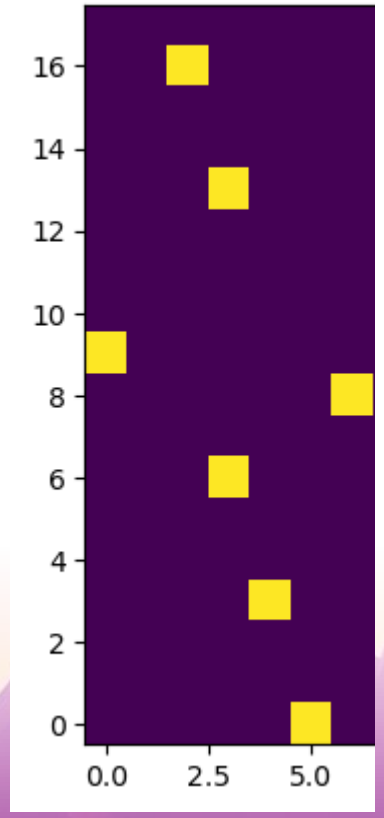




Bouldering route

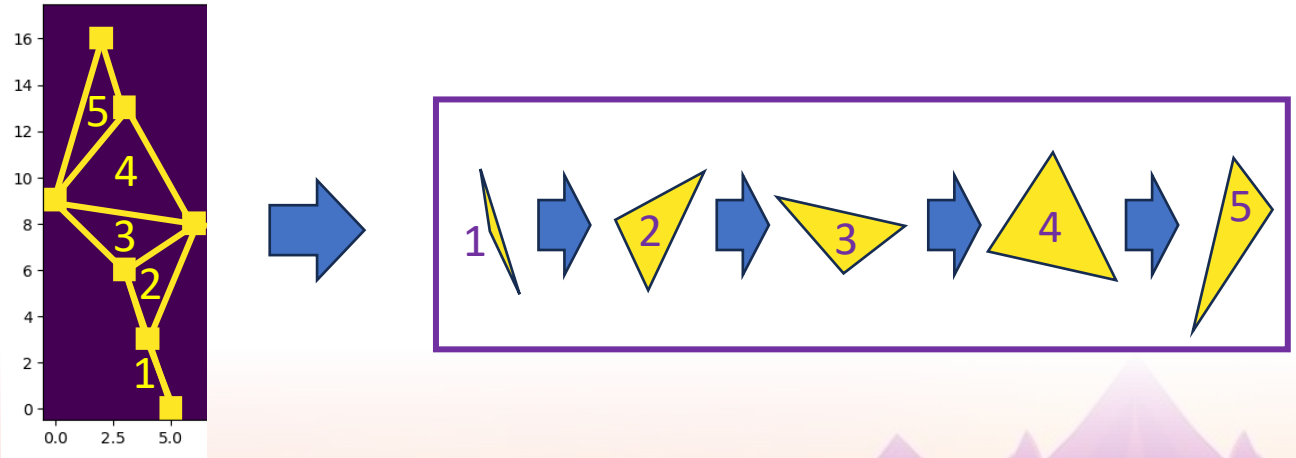
- Assumption: People climb in ‘triangles’
- We extract all triangles per route



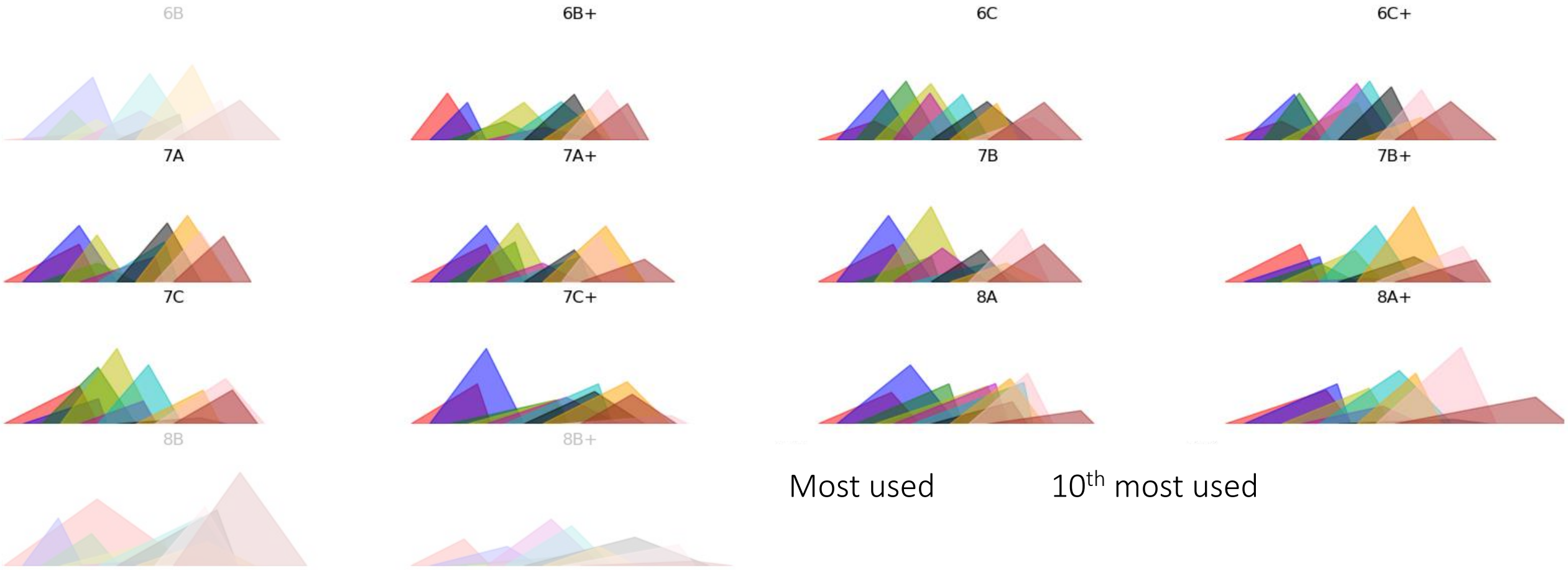


What do we want to measure?

- Creativity of routes
- Proxy:
  - What triangles are used by different route setters and grades?
  - How triangles follow one another?



Most used shapes per grade



Most used

10th most used

Most used shapes for setters with 100+ routes

86a697a1-dacb-46fe-8213-d5912ed3a9a5

6835C519-FE2B-4C35-B612-9784F6247CAB

2ebf2389-10b9-48ae-98a4-7160f77da75c

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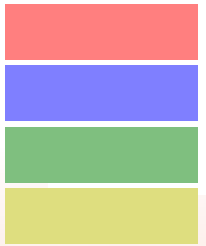
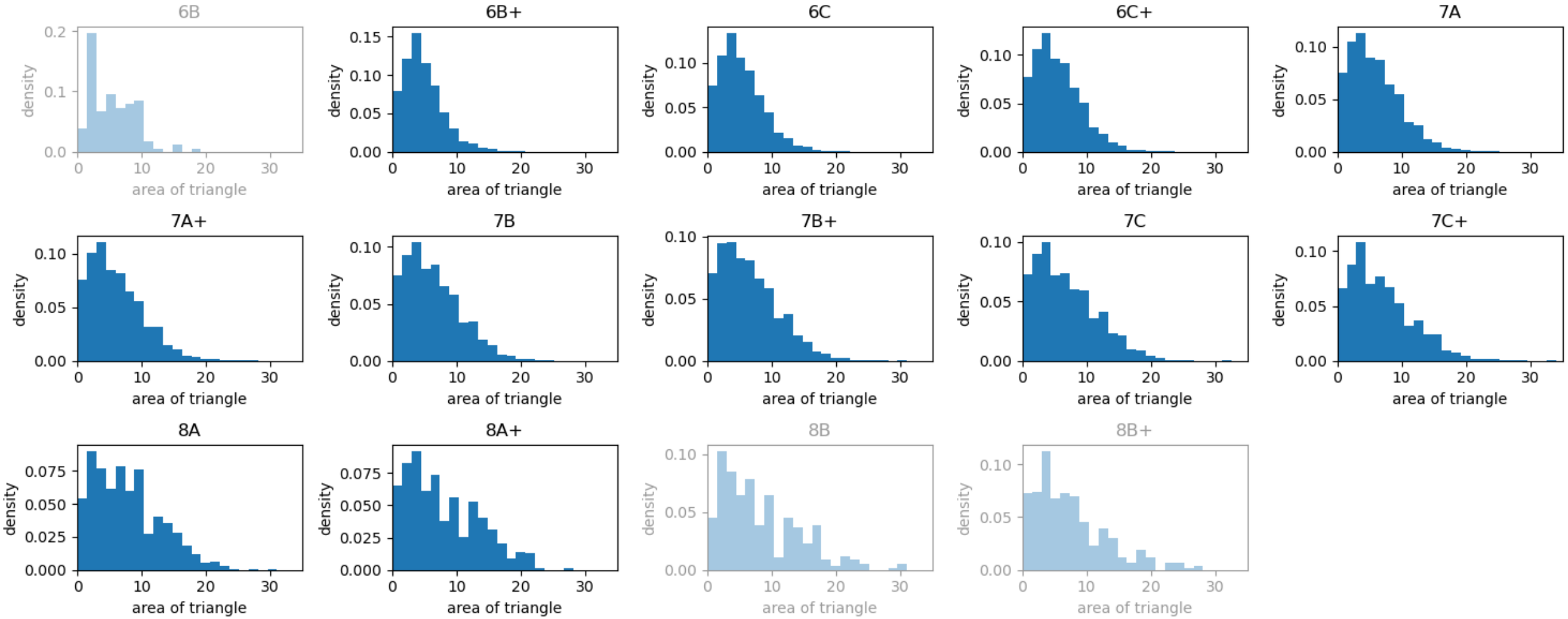


Most used

Fourth most used

Area distribution of 1,700 triangles



Network of triangles

Full network

Backbone

Used more often

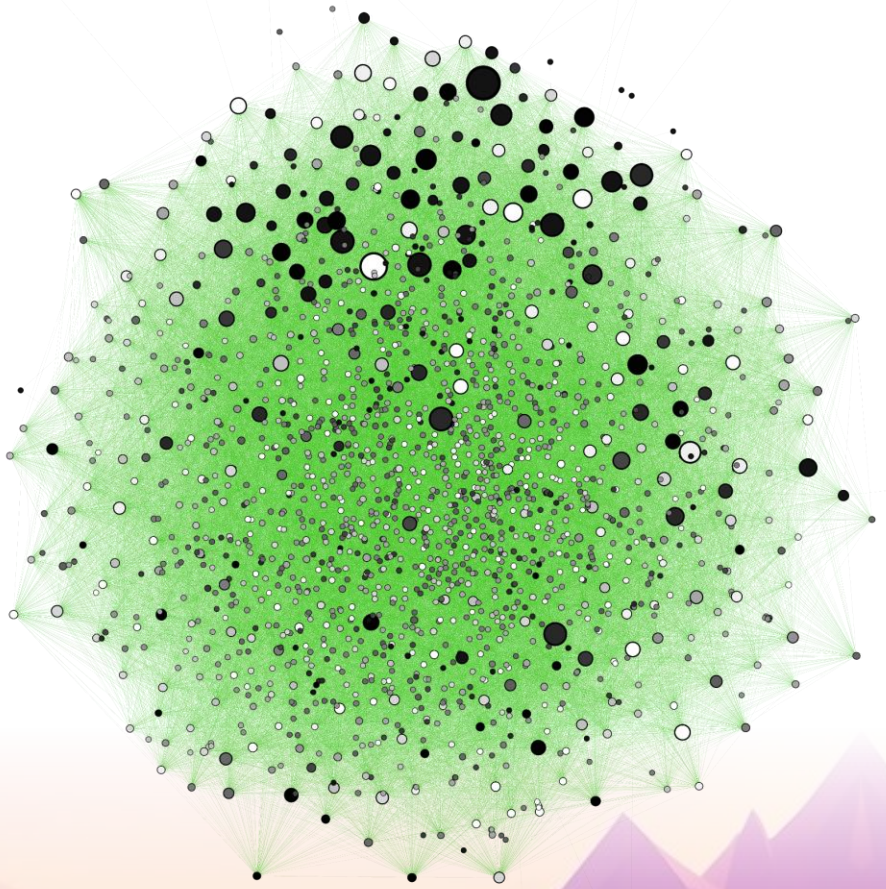
Used less often

Most used in difficulty level

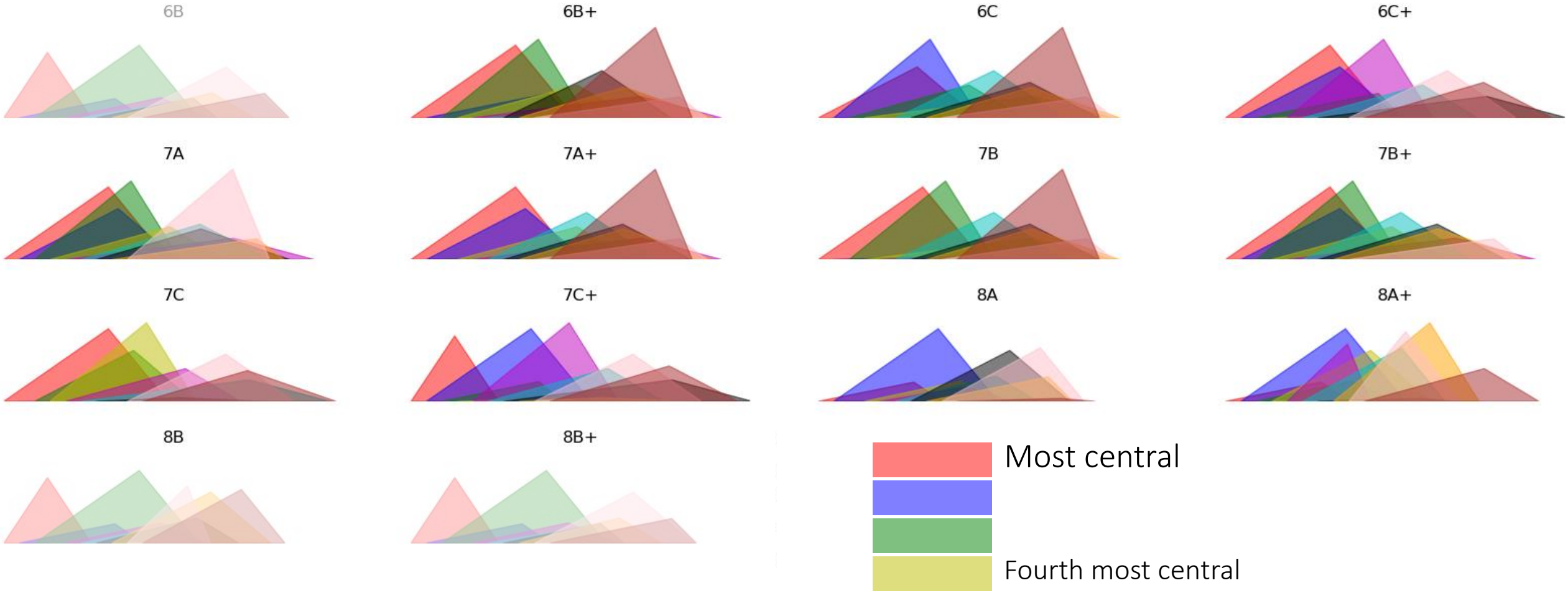
6B

7B

8B+



Highest eigenvalue central shapes per grade



Highest eigenvalue central shapes per setter

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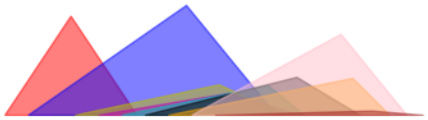

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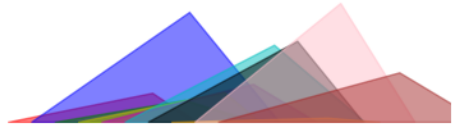

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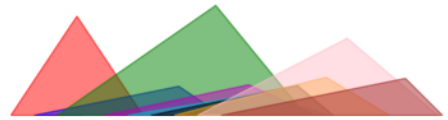

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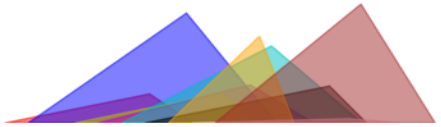

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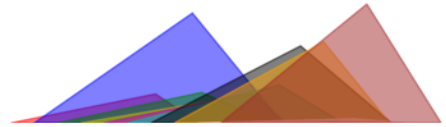

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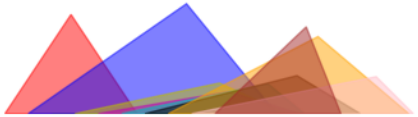

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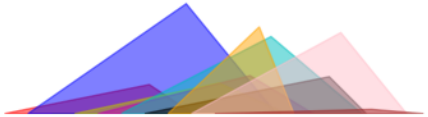

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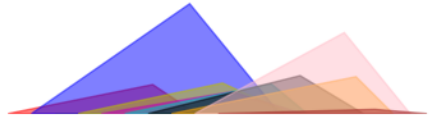

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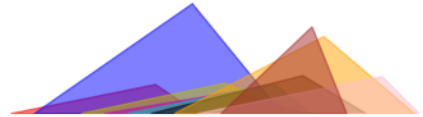

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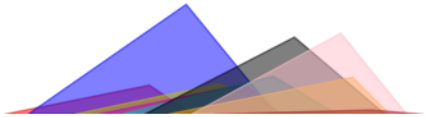

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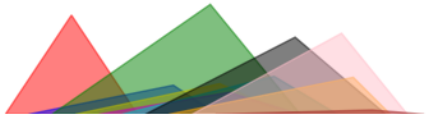

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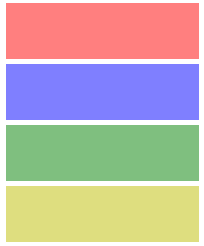

Most central

Fourth most central

Next steps after the summer school

- Refine research question
  - How can we best understand the creative style of individual route setters?
  - Can we classify routes or route setters into different creative classes?
- Possibly iterate feedback with SFI faculty
- Draft paper

Thank you!