

Rock Climbing Route Recommender

Browning Gentry

Recommendations

- When climbing in a new area it is often difficult to identify which routes to attempt
- Can we build a day of climbing personalized for the user?

Factors:

- User's Route History
- Preferred Route Difficulty
- Popularity
- Climbing Style
- Location
- Amount of travel in day



Data Source

All Locations > Colorado > Fort Collins > Poudre Canyon > Triple Tier Area > Old Aid Wall aka
Upper Echelon Wall

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O.D.K.

5.12a YDS ★★★★★ Avg: 3.9 from 68 votes

Type: Sport, 85 ft
FA: Peavey and Gibson
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You & This Route 68

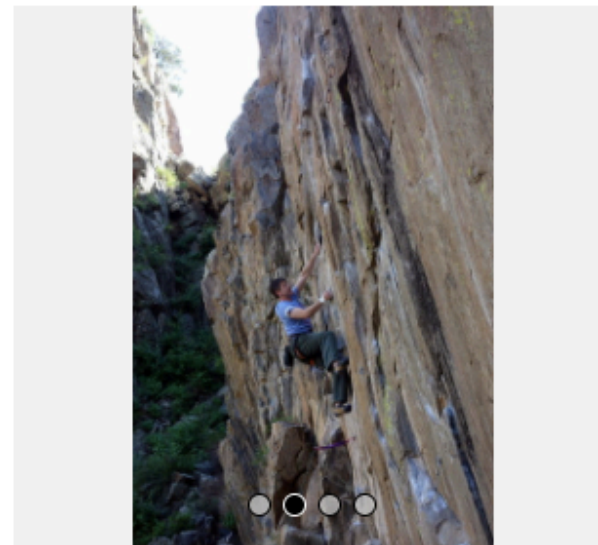
Opinions

Your To-Do List: [Add To-Do](#) · [View List](#)

Your Star Rating: ★★★★★

Your Difficulty Rating: -none- [Change](#)

Your Ticks: [Add New Tick](#)
-none-



Description

This is a *classic* in every way. Powerful in your face initial boulder problem, followed immediately by fun, pumpy, and thoughtful climbing up a right-facing flake. Milk the rests as this baby doesn't let up until you are standing on the ledge next to the chains. *Awesome!*

Data Source

Browning Gentry > Ticks

[Export CSV](#) · [RSS Feed of Ticks](#)

Dear Slabby Feb 23, 2018 · Lead / Flash.	Fort Collins > ... > Palace > Palace Pages	★★★★★	5.11b	Sport
Bolt Line Feb 20, 2018 · TR.	Gunks > ... > z.. Dickie Barre... > c. The Clamshell Wall	★★★	5.8	Trad, TR
Windy City Feb 20, 2018 · TR.	Gunks > ... > z.. Dickie Barre... > c. The Clamshell Wall	★★★★★	5.8-	Trad, TR
Franny and Zoey Feb 19, 2018 · TR.	Central Valley > Rattlesnake Mtn > Rattlesnake Cliff	★★	5.7	Trad
Detox Dihedral Feb 19, 2018	Fort Collins > Red Feather Lakes > Grazing Allotment Crag	★★★	5.11a/b	Trad
Beached Whale Feb 19, 2018	Fort Collins > ... > Rotary Park > Eliminator Boulder	★★★★★	V2+	Boulder
Right Eliminator Feb 19, 2018	Fort Collins > ... > Rotary Park > Eliminator Boulder	★★	V4-	Boulder
Ship's Prow Feb 19, 2018	Fort Collins > ... > Rotary Park > Central Ridgeline, inc...	★★	V0+	Boulder
Pinch Overhang Feb 19, 2018	Fort Collins > ... > Rotary Park > Mental Block	★★★★★	V5	Boulder
Mental Standard Feb 19, 2018	Fort Collins > ... > Rotary Park > Mental Block	★★★★★	V4	Boulder
Penny Pincher Feb 19, 2018	Fort Collins > ... > Rotary Park > Pitch Penny Boulder	★★★	V3+	Boulder

Demo

Climbing Day Recommender

E-Mail (Required):

Minimum Difficulty:

Maximum Difficulty:

Minimum Stars:

Type:

Radius (mi):

Routes/Day:

State:

Sub-Area 1:

Sub-Area 2:

Sub-Area 3:

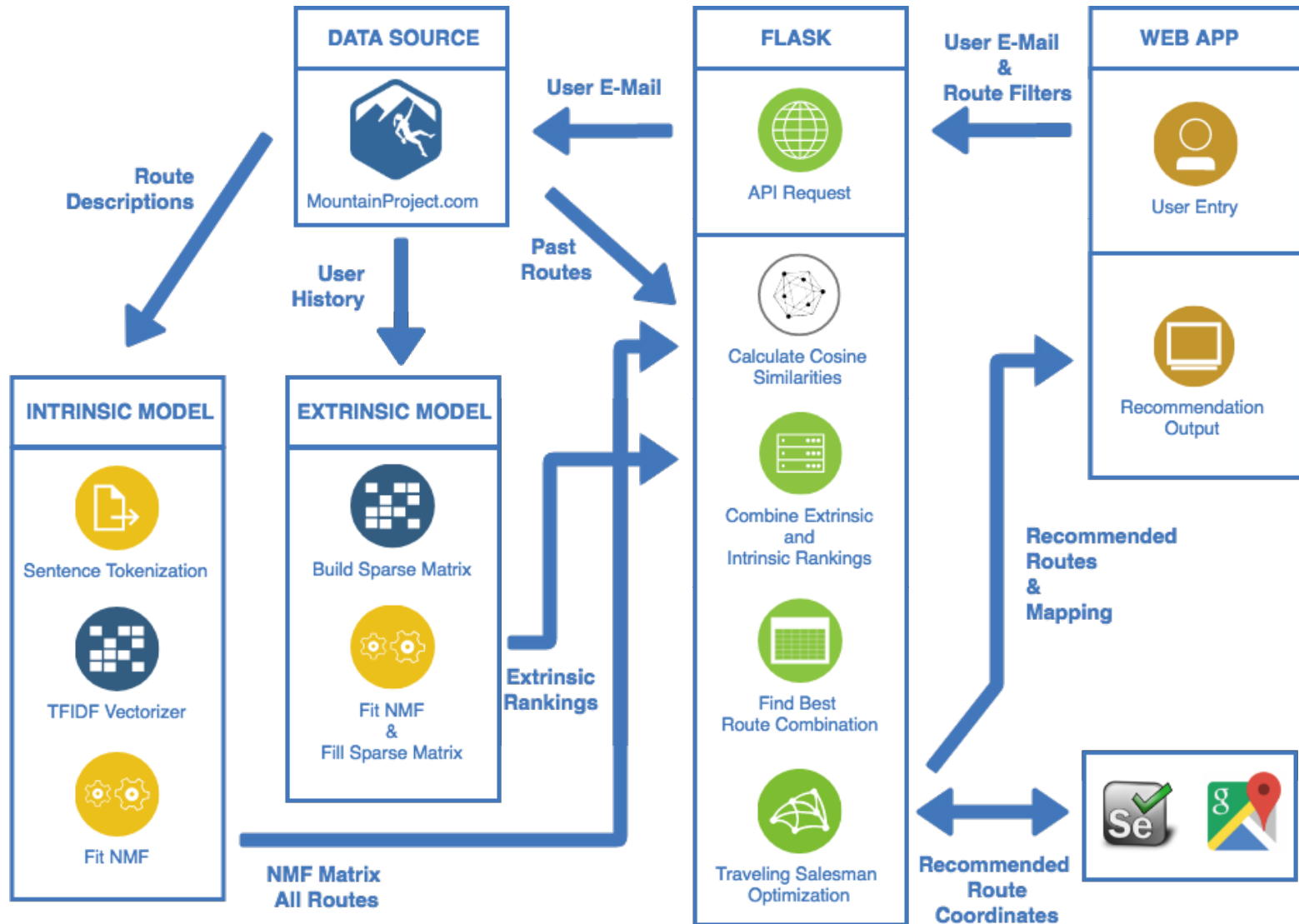
Route Recommendations:

1. [Circuit Breaker](#)
2. [Spock](#)
3. [Can He Share?](#)
4. [Summer School](#)
5. [Barndance, a.k.a. Crankmaster T's Arete](#)
6. [Bro Crack](#)
7. [Monkey Face](#)
8. [Rainy Daze](#)

Map



Web App Structure



Next Steps

- Import more user data to improve extrinsic model
- Create slider for route popularity – vary weights of the extrinsic and intrinsic models
- Include user ratings into extrinsic model

Questions?



Appendix – Intrinsic Model

- Break each document (description) down into sentences
- Vectorize each sentence (TFIDF)
- NMF to topic model each sentence

		Topic			
Route	Sentence	1	2	3	...
1	1				
1	2				
1	3				
2	1				
2	2				
...	...				






Appendix – Intrinsic Model

- Bring in user data from Mountain Project to pare down “training” routes
- User filters from web app to pare down potential routes
- Build a matrix of cosine similarities between “training” routes and potential routes

Cosine Similarity Matrix			User Completed Routes			
Potential Routes	Route	Sentence	A	A	B	...
	1	1	1	2	1	...
	1	2				
	1	3				
	2	1				
	2	2				
				

Appendix – Intrinsic Model

- Take top 5 similarities from each route combination
 - Mitigates issues with varying description lengths
- Average these top similarities

Cosine Similarity Matrix			User Completed Routes			
Potential Routes	Route	Sentence	A	A	B	...
	1	1				
	1	2				
	1	3				
	2	1				
	2	2				
				

Appendix – Intrinsic Model

- Build new matrix with averaged route similarities
- Sum each potential route over all user complete routes to get an overall score
- Rank each potential route by score

		User Completed Routes			Total	Ranking
		A	B	...		
Potential Routes	1				12	4
	2				8	3
	3				3	2
	4				15	5
	5				1	1

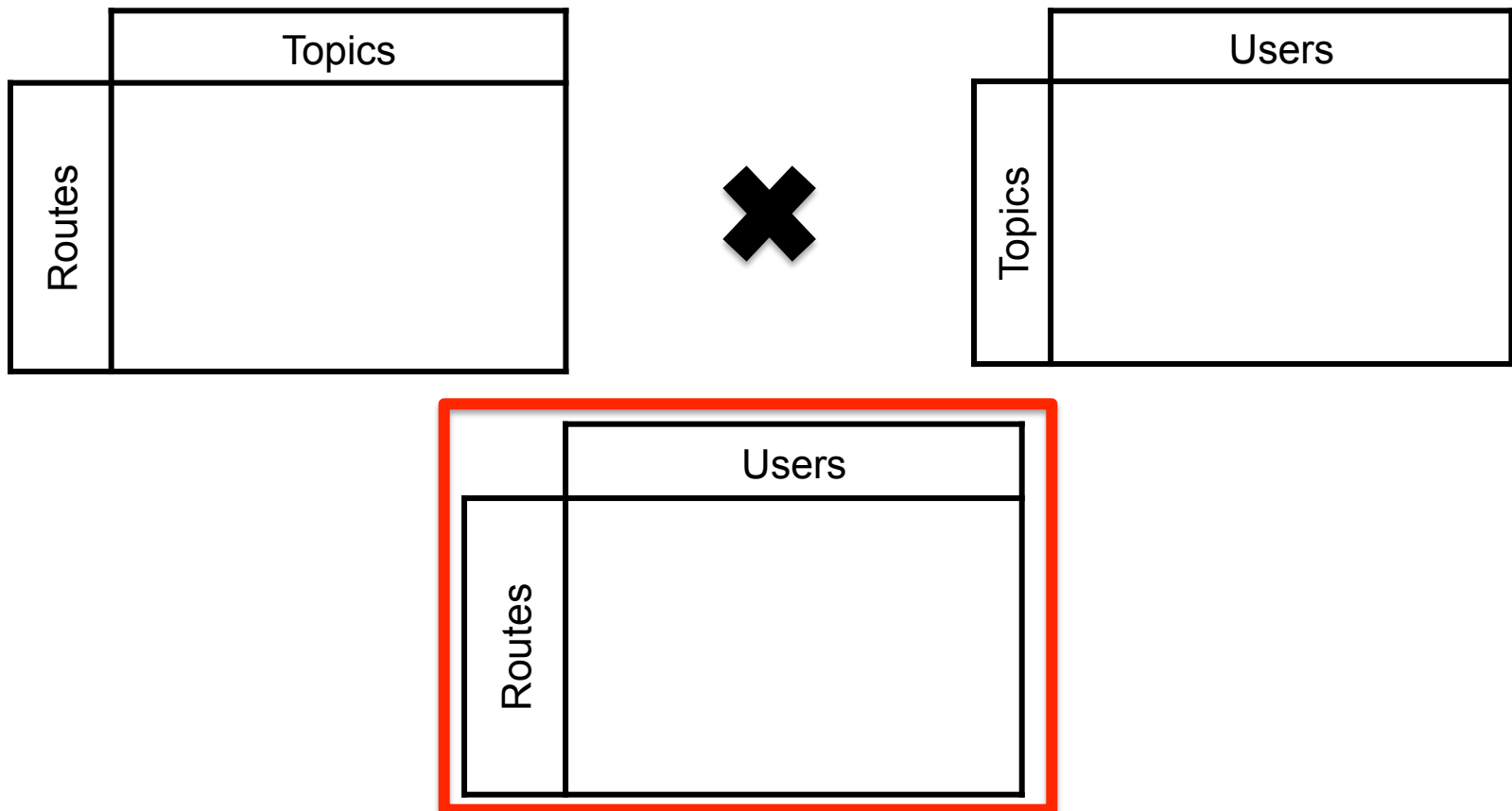
Appendix – Extrinsic Model

- Import user completed routes from Mountain Project API
- Create sparse matrix of users & routes

		Users			
		1	2	3	...
Routes	A	0	1	0	
	B	0	0	0	
	C	1	0	0	
	D	0	0	0	
	E	0	1	1	
	...				

Appendix – Extrinsic Model

- NMF to output Routes by Topics (probabilities) and Users by Routes (components) matrices
- Take the dot product of these two matrices to create “dense” version of sparse matrix



Appendix – Extrinsic Model

- Filter down new dense matrix by same potential routes as in extrinsic model
- Select given from web app
- Rank each potential route for each user

		Users	
		1	Rank
Potential Routes	A		5
	B		1
	D		3
	F		2
	K		4

Appendix – Hybridization

- Join intrinsic and extrinsic models for each route
- Sum intrinsic and extrinsic scores for each route to get final recommender score
- Rank each potential route for each user

		I.R.	E.R.	Overall Ranking
Potential Routes	A	4	5	9
	B	3	1	4
	D	2	3	5
	F	5	2	7
	K	1	4	5

Appendix – Hybridization

- Take every combination of routes in user defined radius
 - Radius calculated via Haversine distance and route coordinates provided on Mountain Project
 - User defines number of routes desired
- Find best total score from all combinations
- Utilize TSP to optimize travel distance between routes in best combination