

Advanced Topics in Control 2020: Large-Scale Convex Optimization

Solution to Exercise 10

Goran Banjac, Mathias Hudoba de Badyn, Andrea Iannelli,
Angeliki Kamoutsis, Ilmura Usmanova

June 8, 2020

1 Problem 1

1. User 25 would very much like *Pokemon Advanced Generation: Rekkuu no Houmonsha Deoxys*, as the predicted rating is 7.467.
2. The top 10 animes Mathias should watch have IDs 2, 137, 8, 9, 2154, 32, 12, 91, 20, and 122. The top 5 that aren't already rated by Mathias are:
 - (a) 8: *Code Geass: Hangyaku no Lelouch R2*
 - (b) 9: *Code Geass: Hangyaku no Lelouch*
 - (c) 32: *Psycho-Pass*
 - (d) 12: *Suzumiya Haruhi no Shoushitsu*
 - (e) 91: *Zetsuen no Tempest*.
3. After rating *Mahou Shoujo Madoka★Magica* a 9/10, the top 10 animes that Mathias should watch have IDs 2, 137, 31, 350, 71, 8, 40, 2154, 237, and 62. The top 5 that aren't already rated by Mathias are now:
 - (a) 350: *Bobobo-bo Bo-bobo*
 - (b) 71: *Darker than Black: Kuro no Keiyakusha*
 - (c) 8: *Code Geass: Hangyaku no Lelouch R2*
 - (d) 40: *Higurashi no Naku Koro ni Kai*
 - (e) 237: *Mobile Police Patlabor: On Television*

Almost all of the recommendations changed. This is absolutely a great feature: as my preferences become more clear and I watch more animes and rate them, the algorithm will update the recommendations with new animes that I haven't seen. This will make me more addicted to anime, thus leading to me giving more money to the streaming website.

4. The top 10 Sci-Fi animes that Mathias should watch have IDs (in the Sci-Fi-only dataset) 99, 2, 8, 51, 2006, 9, 311, 25, 69, and 12. The top 5 that Mathias hasn't already rated are:
 - (a) 8: *Code Geass: Hangyaku no Lelouch R2*
 - (b) 51: *Darker than Black: Kuro no Keiyakusha*

- (c) 9: *Code Geass: Hangyaku no Lelouch*
- (d) 311: *Neon Genesis Evangelion: Death & Rebirth*
- (e) 25: *Psycho-Pass*

Some of these are recommended from the other dataset, suggesting that Mathias' recommendations are highly correlated to the Sci-Fi genre. The animes which are expected for Mathias to rate higher than a 6 are:

- *Steins;Gate*
- *Gintama Movie: Kanketsu-hen - Yorozuya yo Eien Nare*
- *Code Geass: Hangyaku no Lelouch R2*
- *Code Geass: Hangyaku no Lelouch*
- *Cowboy Bebop*
- *One Punch Man*
- *Suzumiya Haruhi no Shoushitsu*
- *Tengen Toppa Gurren Lagann*
- *Steins;Gate Movie: Fuka Ryouiki no Déjà vu*
- *Kiseijuu: Sei no Kakuritsu*
- *Evangelion: 2.0 You Can (Not) Advance*
- *Psycho-Pass*
- *Steins;Gate: Oukoubakko no Poriomania*
- *Neon Genesis Evangelion: The End of Evangelion*
- *Toki wo Kakeru Shoujo*
- *Tenkuu no Shiro Laputa*
- *Ghost in the Shell*
- *Neon Genesis Evangelion*
- *Trigun*
- *Summer Wars*
- *Darker than Black: Kuro no Keiyakusha*
- *Sakasama no Patema*
- *Interstella5555: The 5tory of The 5ecret 5tar 5ystem*
- *Akira*
- *Paprika*
- *Wolfs Rain OVA*
- *Darker than Black: Kuro no Keiyakusha Gaiden*
- *Ergo Proxy*
- *Serial Experiments Lain*
- *Gundam Build Fighters*
- *Mobile Suit Gundam Seed*
- *Wolfs Rain*
- *Kumo no Mukou, Yakusoku no Basho*
- *Toaru Majutsu no Index II*

- *Tsuritama*
- *No.6*
- *Toaru Majutsu no Index: Endymion no Kiseki*
- *Toaru Majutsu no Index*
- *Aldnoah.Zero*
- *Bobobo-bo Bo-bobo*
- *Neon Genesis Evangelion: Death & Rebirth*
- *Deadman Wonderland*
- *Final Fantasy VII: Last Order*
- *Saishuu Heiki Kanojo*
- *Dragon Ball GT*
- *Steins;Gate 0*

5. This is not a good idea. You are losing a lot of information by switching to a binary recommender, and the solution is also poorly scaled and it takes longer to solve. One pro is that the actual data can be saved as a boolean rather than an integer, and so one can store orders of magnitude more data this way. It is also no longer possible to rank animes, since they are labeled “recommend” or “do not recommend”.

Most of the animes that were recommended in the top 5 are also recommended now, but the solution spits out far too many animes to include in this PDF.