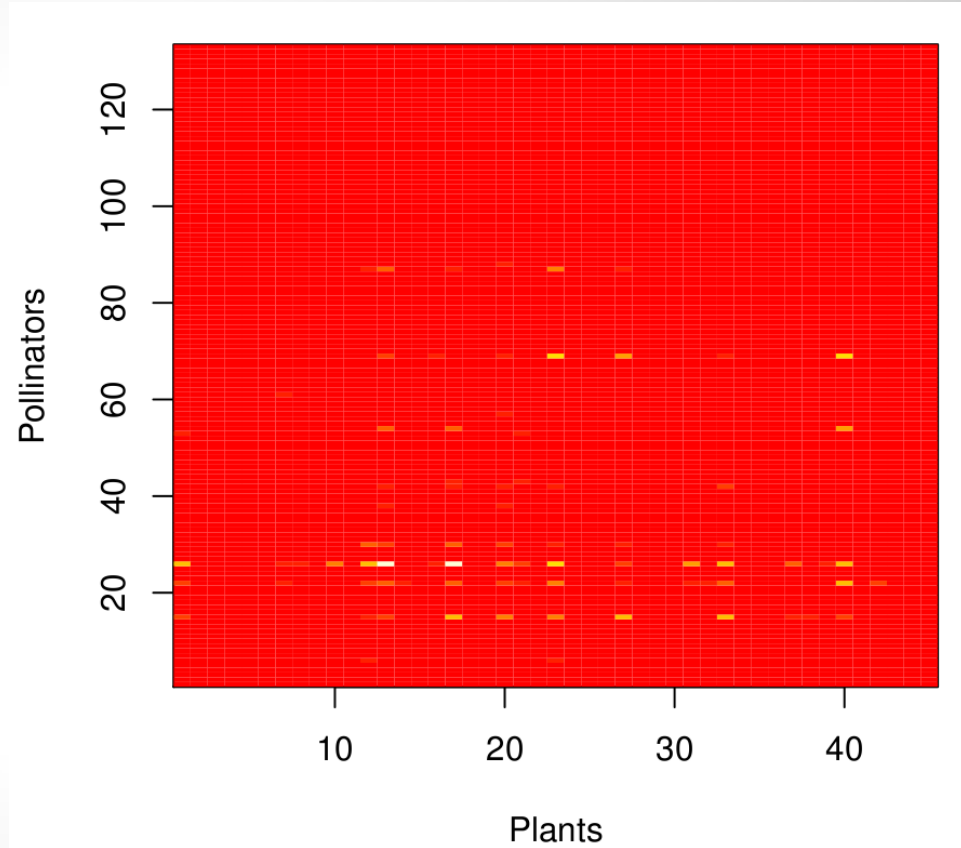


Implicit Feedback for Plant- Pollinator Networks

Jacob Lambert - EISI 2014

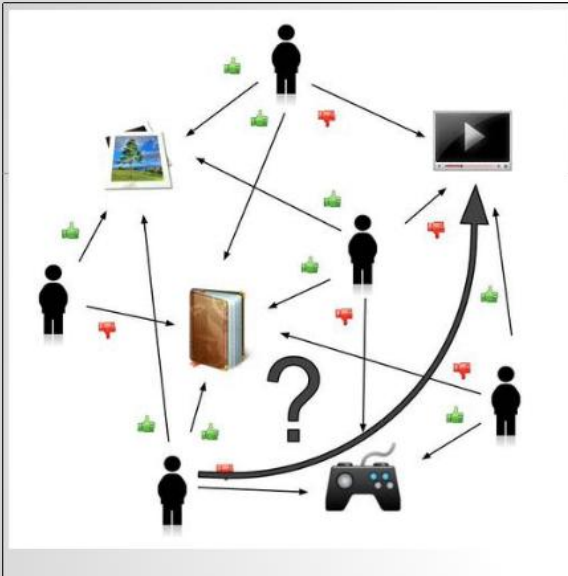
Plant-pollination: Mathematical representations



amazon.com

NETFLIX

Recommender systems and Collaborative Filtering



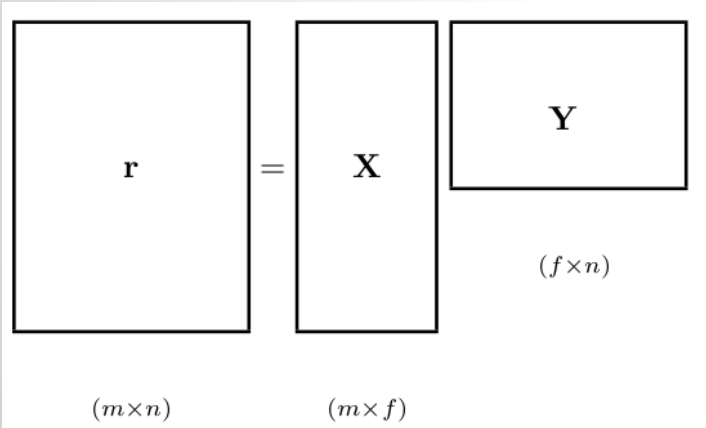
Implicit Feedback

TV show recommender / Plant-pollinator dataset


1. No ratings
2. Implicit positive feedback from behavioural patterns
3. Difficult to infer negative feedback

Implicit Feedback Matrix Factorization (IFMF)

```
> print(pf)
      [,1]      [,2]      [,3]      [,4]      [,5]
[1,] "-0.043" "-0.041" " 0.182" " 0.138" "-0.006"
[2,] " 0.010" "-0.019" "-0.045" "-0.022" " 0.062"
[3,] "-0.160" "-0.076" " 0.047" "-0.014" "-0.016"
[4,] " 0.001" " 0.013" "-0.097" "-0.042" "-0.099"
[5,] " 0.049" "-0.004" "-0.042" "-0.050" " 0.086"
[6,] " 1.005" " 0.052" " 0.027" "-0.055" " 0.065"
```



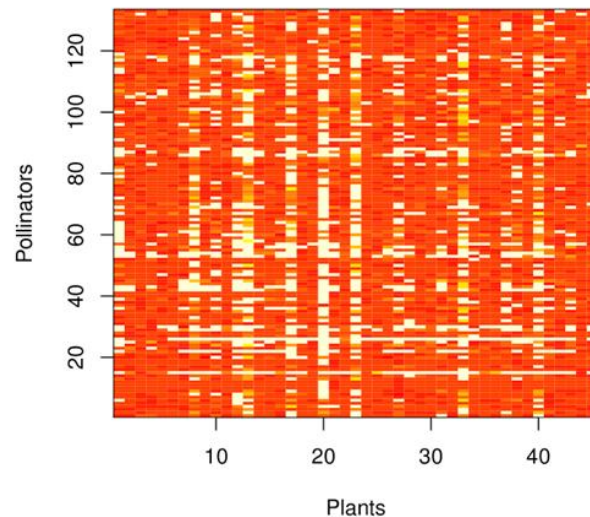
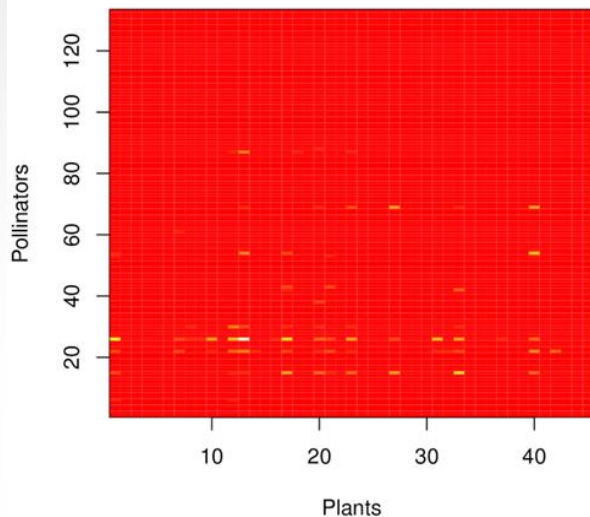
$$\min_{x_*, y_*} \sum_{u,i} c_{ui} (p_{ui} - x_u^T y_i)^2 + \lambda \left(\sum_u |x_u|^2 + \sum_i |y_i|^2 \right)$$


$$x_u = (Y^T C^u Y + \lambda I)^{-1} Y^T C^u p(u)$$

$$y_i = (X^T C^i X + \lambda I)^{-1} X^T C^i p(i)$$

Results and Discussion

- performance ranking
- subsetting training matrix



| Parameters | | | | $\overline{rank} = MPR(train, test)$ | | | | |
|------------|------------|-----------|-----|--------------------------------------|-------|--------------|----------|------------------------|
| α | ϵ | λ | f | ub | lb | (r^s, r^v) | $random$ | (r_{ui}^s, r_{ui}^t) |
| 1 | 10^{-8} | 0.1 | 5 | 0.932 | 0.068 | 0.288 | 0.500 | |
| 20 | 10^{-8} | 0.1 | 5 | 0.932 | 0.068 | 0.348 | 0.500 | |
| 20 | 10^{-8} | 5 | 20 | 0.932 | 0.068 | 0.282 | 0.500 | |
| 20 | 10^{-8} | 0.5 | 30 | 0.932 | 0.068 | 0.245 | 0.500 | 0.249 |

Future Work

Comparison

- popularity-based model
- abundance-based model

- Factor interpretation
- Recommendation explanations

| So You Think You Can Dance | Spider-Man | Life In The E.R. |
|--|--|--|
| Hell's Kitchen Access Hollywood Judge Judy Moment of Truth Don't Forget the Lyrics | Batman: The Series Superman: The Series Pinky and The Brain Power Rangers The Legend of Tarzan | Adoption Stories Deliver Me Baby Diaries I Lost It! Bringing Home Baby |
| Total Rec = 36% | Total Rec = 40% | Total Rec = 35% |

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- Julia Jones - *program administration*
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- Andy Moldenke - *resident entomologist*

Questions?

