

**Predicting Links in Plant-Pollinator  
Interaction Networks using Latent Factor  
Models with Implicit Feedback:  
Supplemental Material**

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## Precision-Recall Curves for Test Year 2011 to 2015

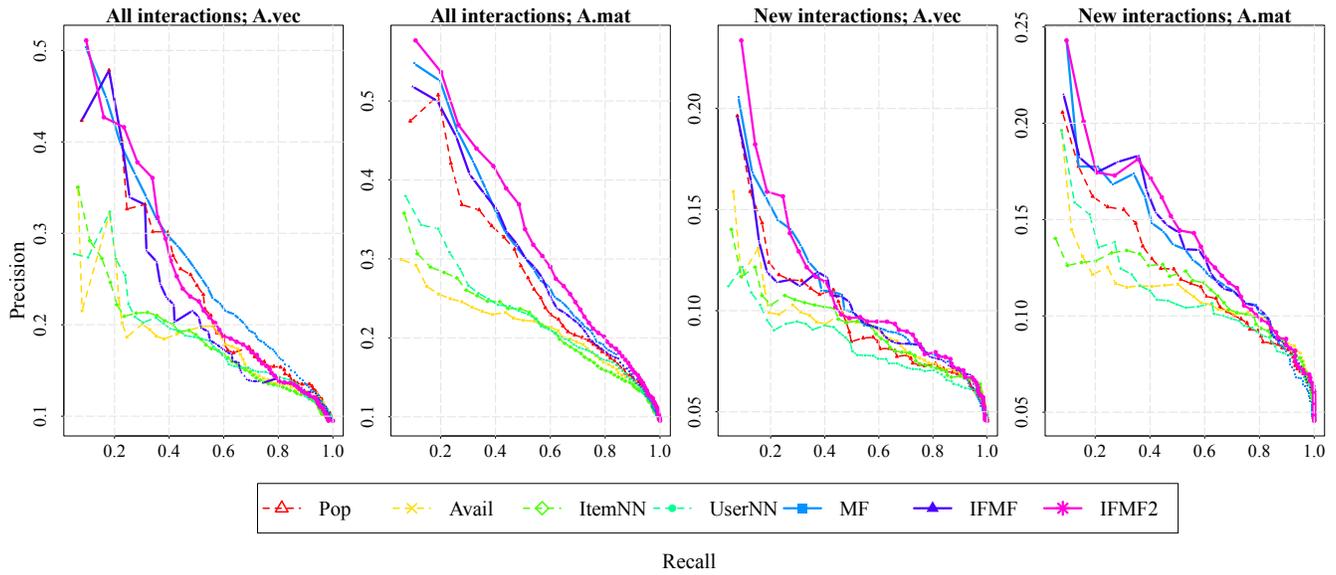


Figure 1: Precision-Recall curves for all methods in test year 2011. Plots show results for predicting all interactions vs. only new interactions and considering availability based on plants only (A.vec) vs. plants and pollinators (A.mat).

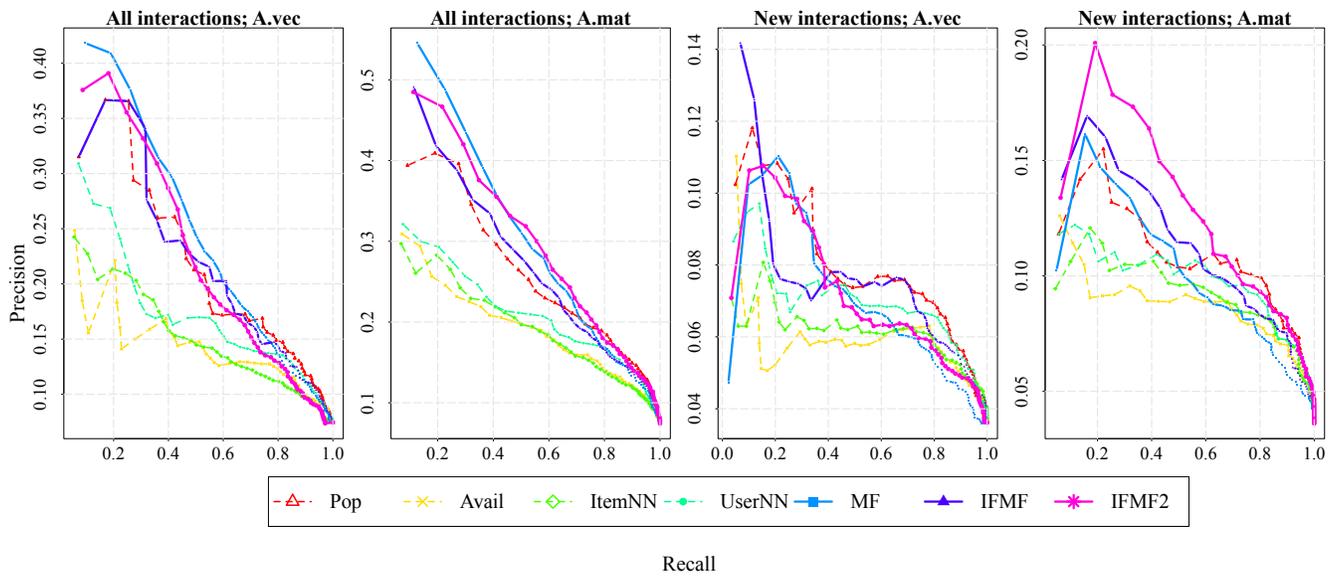


Figure 2: Precision-Recall curves for all methods in test year 2012. Plots show results for predicting all interactions vs. only new interactions and considering availability based on plants only (A.vec) vs. plants and pollinators (A.mat).

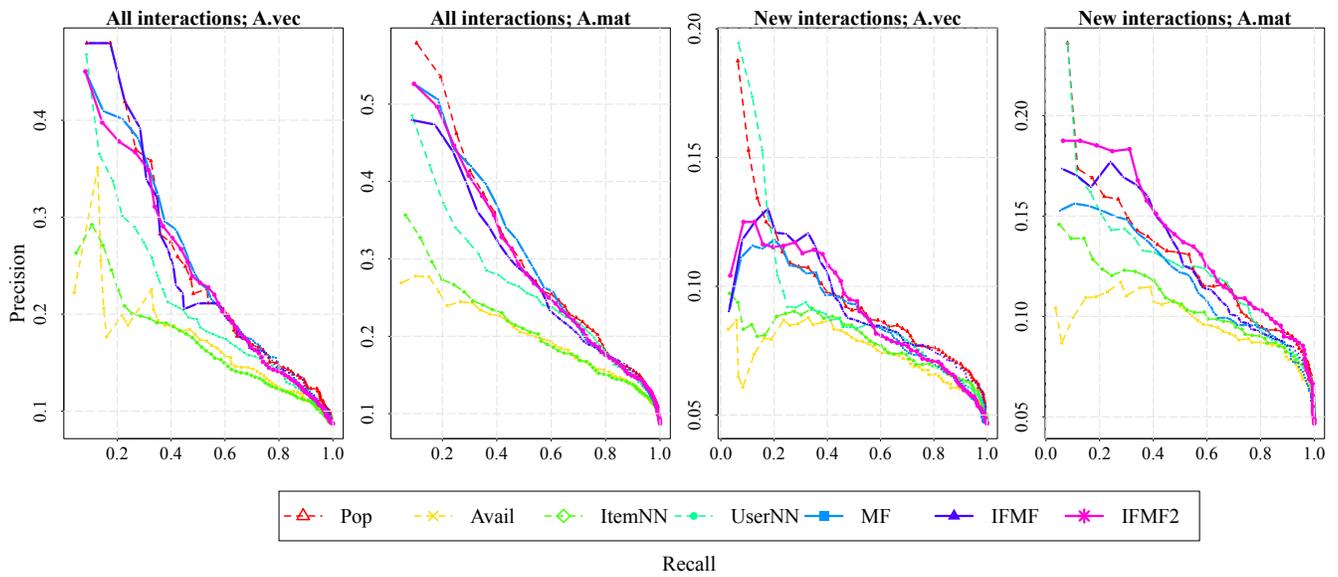


Figure 3: Precision-Recall curves for all methods in test year 2013. Plots show results for predicting all interactions vs. only new interactions and considering availability based on plants only (A.vec) vs. plants and pollinators (A.mat).

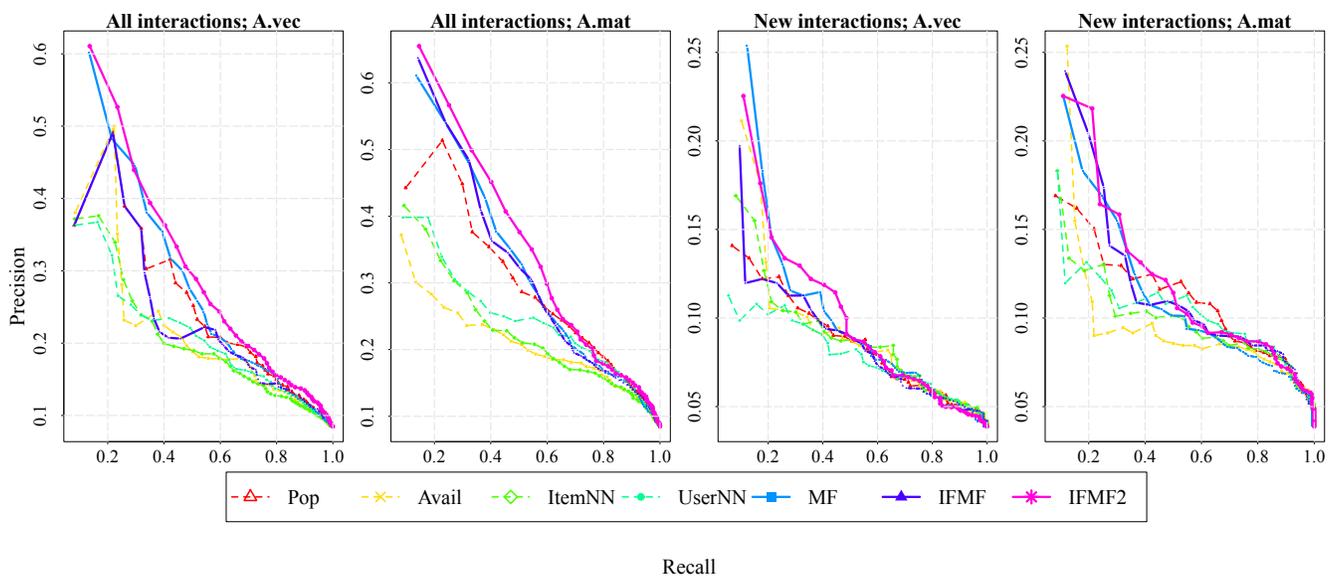


Figure 4: Precision-Recall curves for all methods in test year 2014. Plots show results for predicting all interactions vs. only new interactions and considering availability based on plants only (A.vec) vs. plants and pollinators (A.mat).

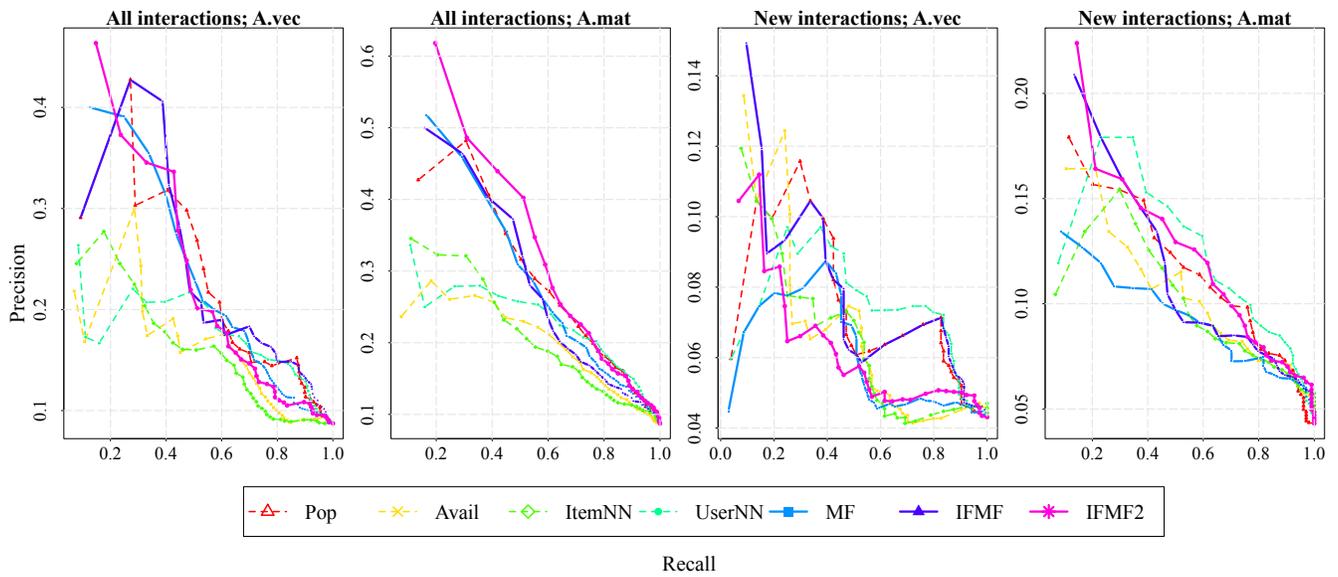


Figure 5: Precision-Recall curves for all methods in test year 2015. Plots show results for predicting all interactions vs. only new interactions and considering availability based on plants only (A.vec) vs. plants and pollinators (A.mat).

## Clustering Analysis in Latent Spaces

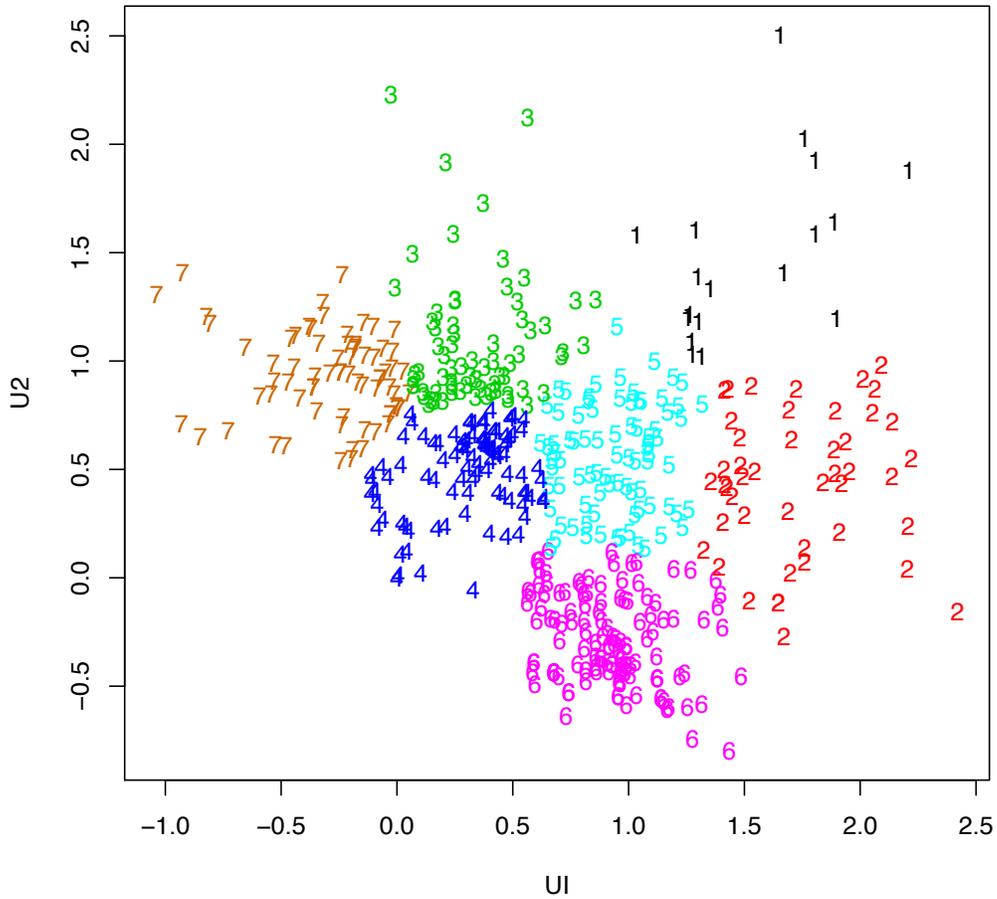


Figure 6: Pollinator species clustered into seven classes in the latent factor space learned by IFMF2 with  $k = 2$  factors. According to a pollination expert, clusters 1 and 2 are groups of common species while clusters 4, 5, and 6 are groups of rare species. Clusters 3 and 7 represent specialists while clusters 1, 2, and 5 show generalists. The species in clusters 4, 5, and 6 tend to appear early in the year while species in clusters 3 and 7 appear later in the year.

	Degree	Interaction count	Occurrence count
Cluster 1	32.7	3897.4	80.5
Cluster 2	13.2	323.8	31.1
Cluster 3	5.8	65.3	9.0
Cluster 4	1.9	7.8	2.7
Cluster 5	6.1	58.5	9.8
Cluster 6	1.7	6.3	2.3
Cluster 7	2.2	23.8	2.9

Table 1: Statistics of the average degree of pollinator species, average number of interactions (raw count of all interactions), and average number of occurrences (count of meadow-watches where the species appeared) over all pollinator species in each cluster. Degree indicates the average number of plant species with which pollinator species in the group interacted.

	Degree	Interaction count	Occurrence count
U1	0.40	0.29	0.39
U2	0.41	0.43	0.35

Table 2: Spearman correlation between the latent factors of pollinator species and data summaries.

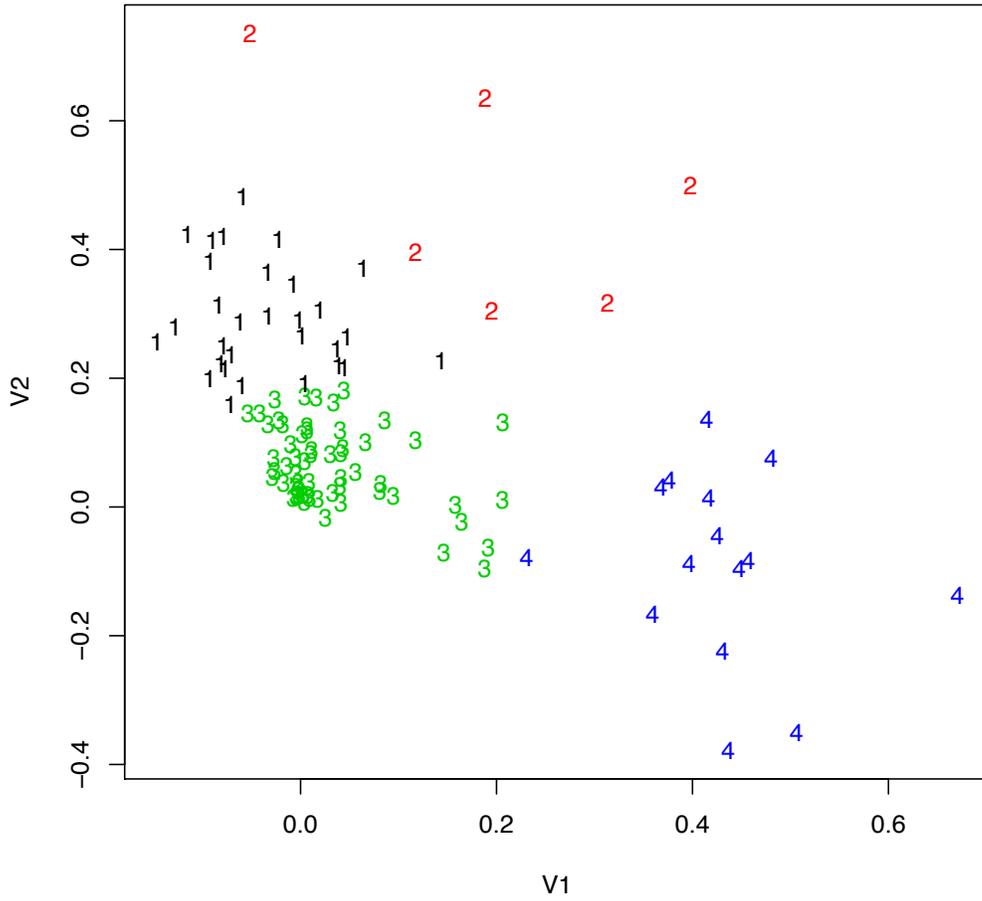


Figure 7: Plants species clustered into four clusters in the latent factor space learned by IFMF2 with  $k = 2$  factors. According to a pollination expert, clusters 2 and 4 are groups of common generalists and cluster 2 has more generalized species than class 4. Cluster 1 is a group of specialists. Cluster 3 is a mix of species types.

	Degree	Interaction count	Abundance	Occurrence count
Cluster 1	20.3	603.3	11406.2	32.1
Cluster 2	116.2	9396.2	52284.7	84.3
Cluster 3	8.3	64.3	6971.4	23.7
Cluster 4	57.6	1296.8	63610.5	50.7

Table 3: Statistics of the average degree of plant species, average number of interactions, average flower abundance (raw count), and average flower occurrence (number of meadow-watches where the species occurred) over all species in each cluster. Degree indicates the number of pollinator species with which plant species interacted. The flower abundance is available from flower surveys.

	Degree	Interaction count	Abundance	Occurrence count
V1	0.42	0.34	0.31	0.24
V2	0.33	0.40	0.13	0.19

Table 4: Spearman correlation between the latent factors of plant species and data summaries.