

Product Assignment Recommender

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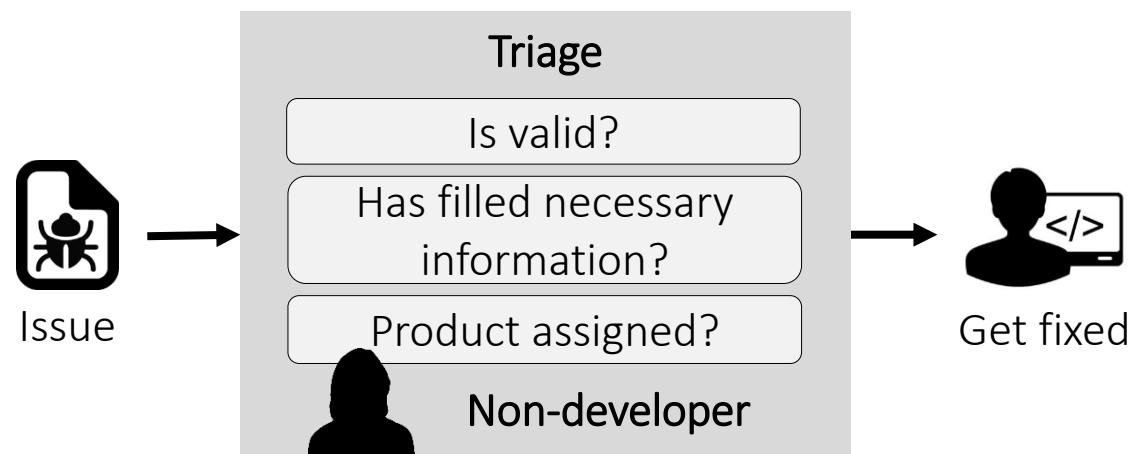
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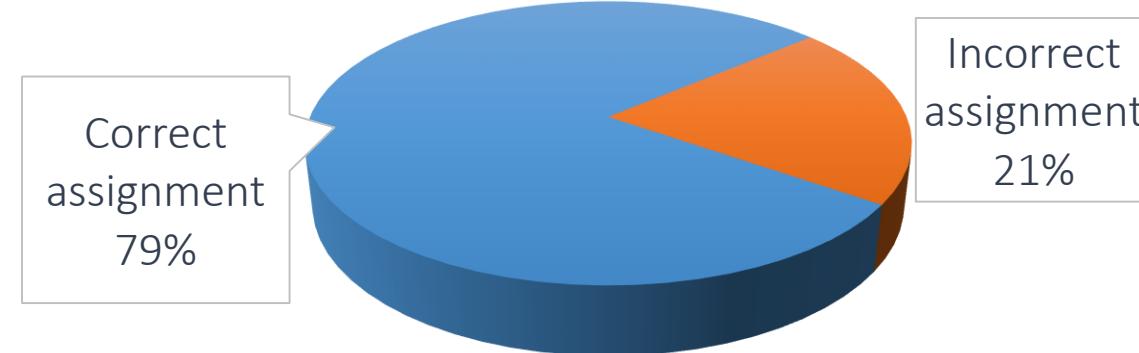
In issue-tracking system of open source projects

- Volunteers help to filter incoming issues
 - Check if the issue is valid
 - Check if the issue has necessary information filled
 - Determine the location/product
- In Mozilla, non-developer volunteers help to assign 29% of issues



Assigning issues to products is challenging

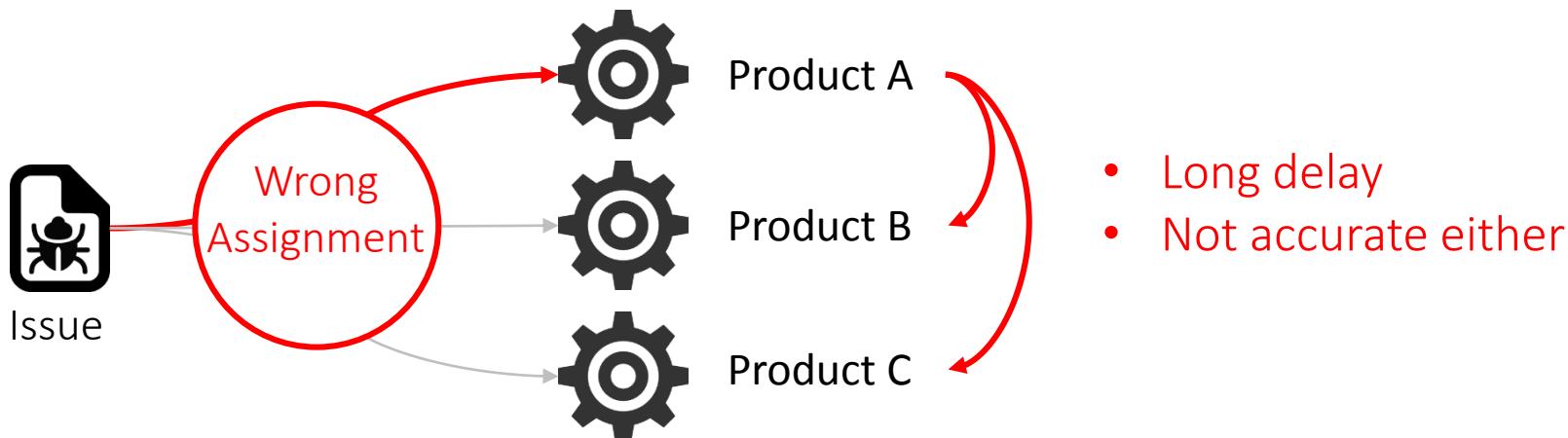
- In Mozilla, over 21% of product assignments are incorrect¹
 - Error rate of developers: 18%
 - Error rate of Non-developer: 29%



¹J. Xie, M. Zhou and A. Mockus. Impact of triage: a study of Mozilla and Gnome. ESEM2013

Product assignment is critical for fixing issue

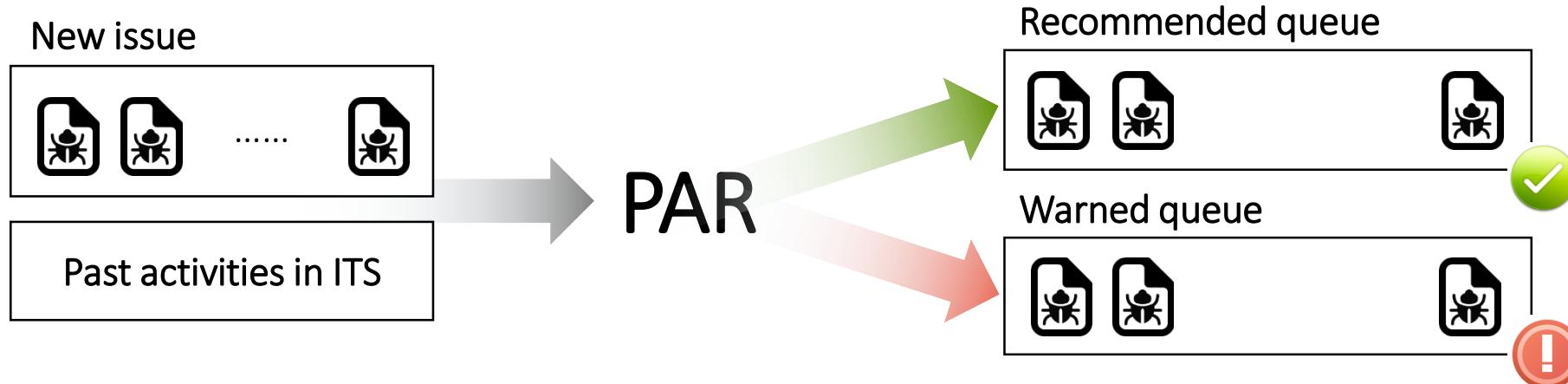
- If the issue goes to the wrong product
 - It may take long time until the team notices that the issue is not caused by that product
 - Product team may not be familiar with the other products, so the next assignment may not be accurate either



Product Assignment Recommender

- how does it work?

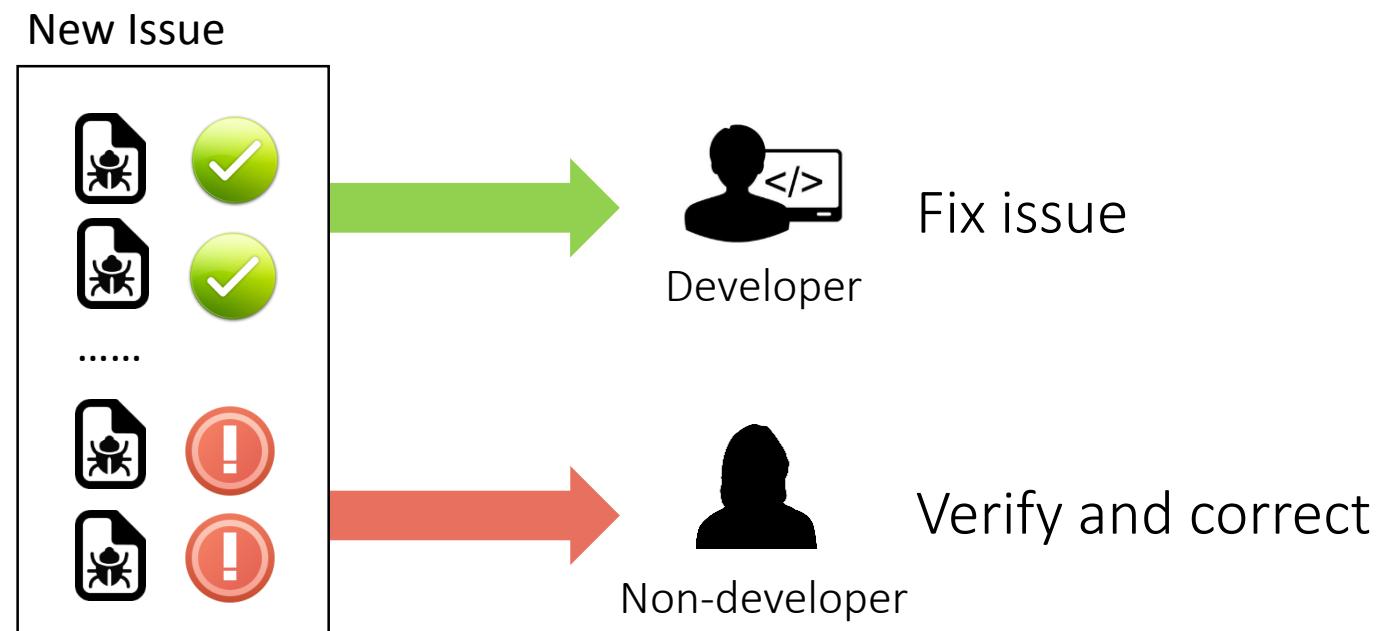
- Learn from the past activities
- Estimate the odds that a product assignment is incorrect
- Put the new issues into two queues (based on threshold)
 - “Recommended” queue: high-accuracy assignments
 - “Warned” queue: low-accuracy assignments



Product Assignment Recommender

- what can it help?

- Help developer focus their limited time on relevant issues
 - So that developer can concentrate on fixing real problems
- Improve the accuracy of assignment
 - By crowd-sourcing non-developers to verify and correct low-accuracy assignment



Product Assignment Recommender

- how to use PAR? (1)

- Training: feed PAR with historical data-set
- Predicting: set accuracy threshold, get two queues of issues

Data Source: Mozilla Bugzilla Time Span: 2001-2011

Set Threshold

Warn

Recommend

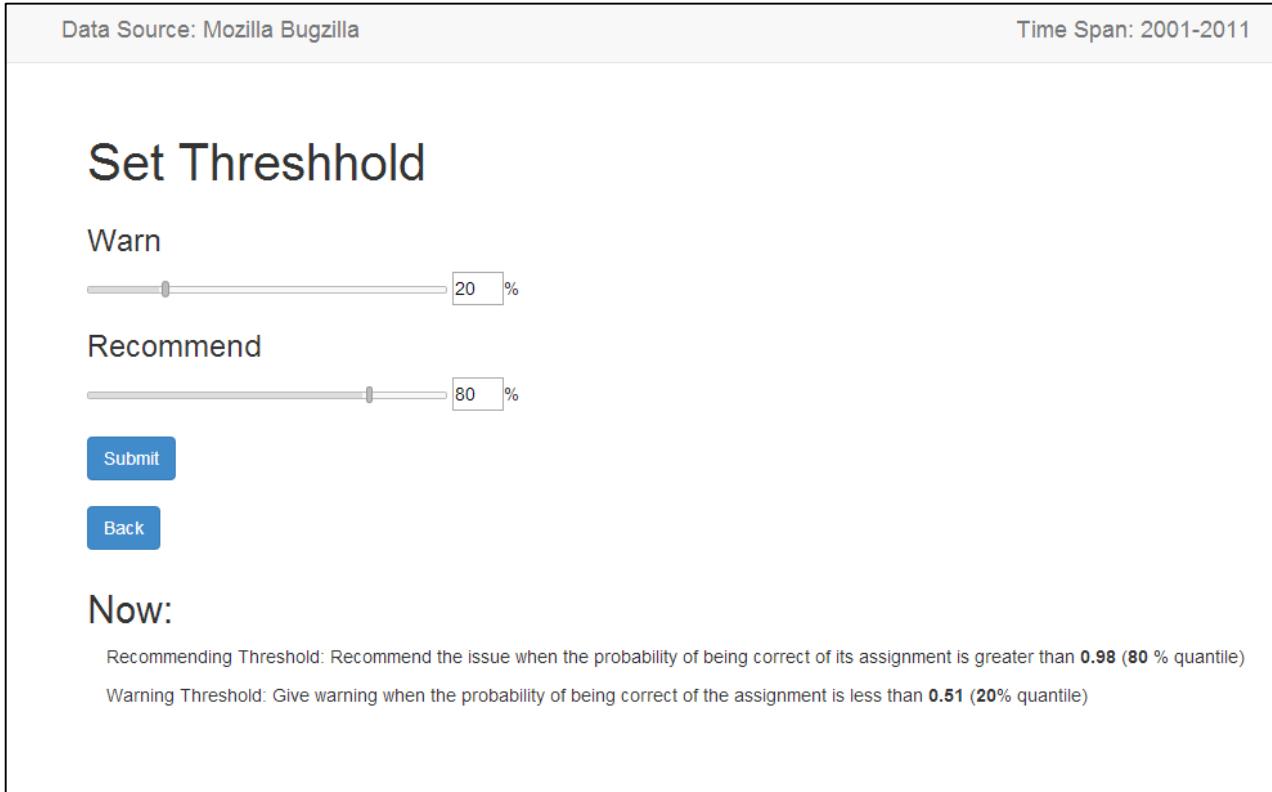
Submit

Back

Now:

Recommending Threshold: Recommend the issue when the probability of being correct of its assignment is greater than **0.98 (80 % quantile)**

Warning Threshold: Give warning when the probability of being correct of the assignment is less than **0.51 (20% quantile)**



Product Assignment Recommender

- how to use PAR? (2)

- Developers/triagers, could:
 - start their work by picking issues from the queue
 - check the accuracy of a particular issue

Data Source: Mozilla Bugzilla Time Span: 2001-2011

PAR

Product Assignment Recommender

BugID Predict Set Threshold

Recommended Issues		Problematic Issues	
BugID	Product	BugID	Product
627020	Calendar	644300	Mozilla Labs
627426	Calendar	664115	Websites
644440	NSS	631062	Mozilla Labs
635778	NSS	586446	Websites
659115	quality.mozilla.org	618707	Websites
629299	NSS	624563	Mozilla Labs
624221	Tamarin	631055	Mozilla Labs

BugID: 644440
Product: nss
Actor: alvolkov.bgs@gmail.com

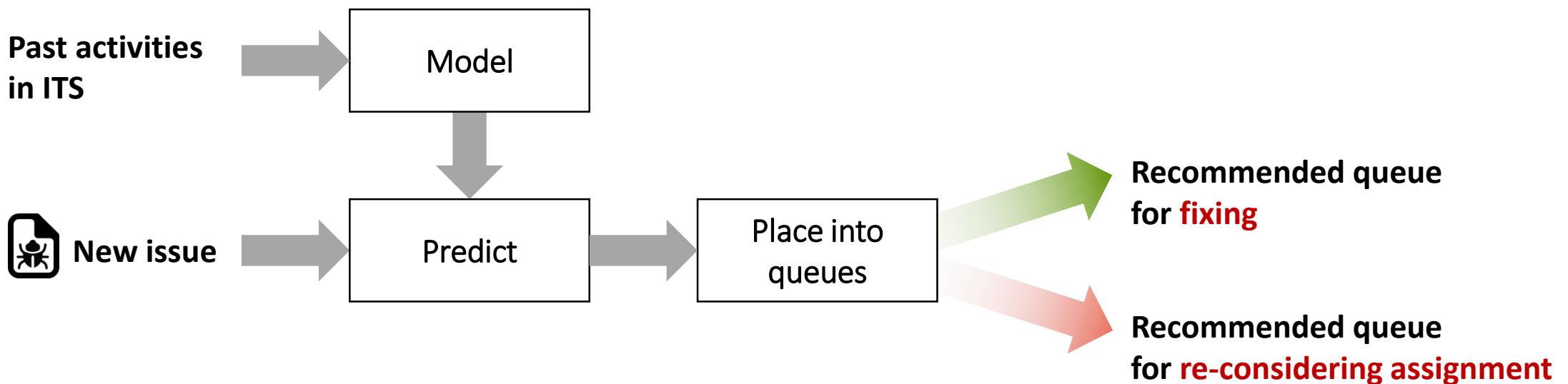
Prediction:

Metrics Calculated

Product	
Product's Error Rate	0.07
Actor	
Actor's Error Rate for The Product	0.00
Maximum Experience over All Peers	1
Number of Actor's Peers	3
Average Social Depth	452.00
Actor's Role	triager

Approach

- Model the accuracy of product assignment
- Predict the accuracy of product assignment for the new issue
- Place the issue into queues according to its accuracy

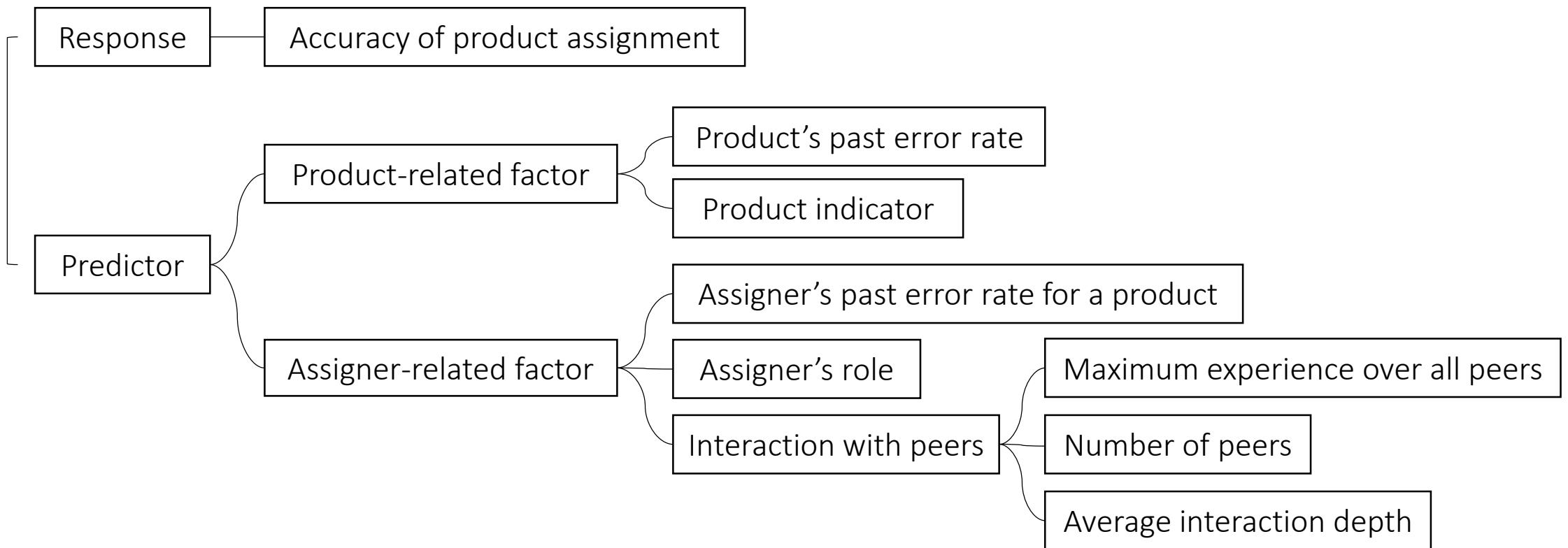


Approach

- Model the accuracy of product assignment
 - Mozilla data set
 - From 2001 to 2011
 - 102K assignments on 88K issues (15% of the original corpus)

Approach

- Model the accuracy of product assignment
 - Build linear regression model



Approach

- Model the accuracy of product assignment
 - Product assignment model (28% deviance explained)

$$isProductCorrect \sim Perr + TrPErr + \lnMaxSNExp + \lnSsize + \lnAvgSNDep + Role + P$$

Predictor	Estimate	P-value	Dev expl
(Intercept)	-11.47	0.96	
Product error rate	-1.30	0.00	14000
Assigner's error rate on product	-3.04	0.00	7683
Assigner's role			831
Max experience over all peers	0.16	0.00	757
Number of peers	-0.24	0.00	566
Average interaction depth	-0.11	0.00	41
Product indicator			4162

Evaluation

- Use one year of history to fit the model
- Predict the incorrect assignments in the next year
 - Choose the lowest 5% and 10% predicted probability of being correct

Prediction quartile	Precision	Recall	F_1 Score
5%	73.65%	20.55%	0.31
10%	63.89%	33.90%	0.42

The precision is 3.4 times higher than a random predictor

Conclusion

- Aiming to improve the effectiveness of development process, we design PAR
 - Highlight problematic issues
 - Focus developers time on relevant issues
- Future work
 - Model accuracy of other fields and integrate the model into PAR
 - Extend PAR in both commercial and open source project

Different Roles in Mozilla

