

Traceability-IR 使用说明

2014.9.10

主要功能：

- Ranklists 的五种筛选方式
- 各种评价指标的计算

“对于一份需求文档和代码，
我们可以利用 IR 技术，
计算其两者间的相似度矩阵。”

假设我们得到这样一个相似度矩阵

Path.MATRIX_SCORE_DB = data/itrust/matrix/iTrust-req-score.db

	class	UC1	UC2	UC3	UC4	UC5	
1	MonitorAdverseEventAction::getReports	0.0179389310...	0.0	0.0	0.0	0.0515878226...	0.0
2	ViewPatientOfficeVisitHistoryAction::getPatients	0.04423493045...	0.0	0.00153706601...	0.01739632311...	0.02943970769...	0.0
3	RemoteMonitoringDAO::getPatientsData	0.15823734603...	0.09417058923...	0.07261262198...	0.12132746486...	0.16953488491...	0.0
4	sendMessage_jsp::jspService	0.11483153289...	4.49066483306...	0.08177505526...	0.04668503151...	0.15060462069...	0.0
5	UpdateHospitalListAction::updateInformation	0.00654401210...	0.22028018674...	0.0	0.07025527363...	0.03763784315...	0.0
6	ChangeSessionTimeoutAction::changeSessionTimeout	0.0	0.0	0.32801551547...	0.0	0.0	0.0
7	PersonnelDAO::addEmptyPersonnel	0.0	0.10496287475...	0.07780013320...	0.02112979251...	0.0	0.0
8	GetVisitRemindersAction::getImmunizationNeeders	0.04094895721...	0.00922902931...	0.00925669483...	0.01164068086...	0.02943970769...	0.0
9	UpdateNDCCodeListAction::addNDCCode	0.0	0.01065989263...	0.00925669483...	0.05194862207...	0.02943970769...	0.0
10	CPTCodesDAO::updateCode	0.0	0.0	0.01195034165...	0.04266679991...	0.03800649921...	0.0
11	OfficeVisitDAO::update	0.0	0.0	0.0	0.04266679991...	0.0	0.0
12	PersonnelDAO::getPersonnel	0.06474598631...	0.16303229763...	0.01463611964...	0.01840553252...	0.04654826498...	0.0
13	EmergencyReportAction::getPatientGender	0.03801057424...	0.0	0.00171849204...	0.01944968052...	0.0	0.0
14	hospitalListing_jsp::jspService	0.06260137828...	0.07395257996...	0.04005801734...	0.04649978475...	0.15309638182...	0.0
15	MonitorAdverseEventAction::getName	0.02536947953...	0.0	0.0	0.0	0.07295619843...	0.0
16	HospitalsDAO::getAllHospitals	0.0	0.46872522708...	0.0	0.0	0.0	0.0
17	EditRepresentativesAction::removeRepresentative	0.07610843861...	0.04574195511...	0.0	0.19723547614...	0.03647809921...	0.0
18	RiskChecker::isAtRisk	0.0	0.0	0.0	0.0	0.0	0.0
19	ViewMyRemoteMonitoringListAction::getPatientD...	0.14238701261...	0.08859792777...	0.06136886641...	0.10254042314...	0.16816422352...	0.0
20	UpdateHospitalListAction::addHospital	0.0	0.22028018674...	0.0	0.05194862207...	0.0	0.0
21	AddRemoteMonitoringDataAction::addRemoteM...	0.05959797614...	0.08596559329...	0.0	0.11212812128...	0.0	0.0
22	AllergyDAO::getAllergies	0.0	0.0	0.0	0.0	0.0	0.0
23	ViewMyRecordsAction::getRepresented	0.01426306989...	0.00141562822...	4.73290600428...	0.05418870586...	0.03951173808...	0.0
24	ViewMyRecordsAction::getFamily	0.01426306989...	0.00141562822...	4.73290600428...	0.00119036544...	0.03951173808...	0.0
25	ViewPrescriptionRenewalNeedsAction::getRenew...	0.04945615573...	0.0	0.00171849204...	0.01944968052...	0.03291459382...	0.0
26	AddPatientValidator::validate	0.04389083053...	0.0	0.00198434369...	0.04685713936...	0.07142779843...	0.0
27	LONGDAO::addLONG	0.0	0.0	0.0	0.02088202015...	0.0	0.0

+ - Edit 264 records. 0.6 seconds. Filter

...和相应的 Oracle

Path.ORACLE_LITE_DB = data/itrust/matrix/iTrust-req-lite.db

	class	UC1	UC2	UC3	UC4	UC5	UC6	UC8	UC9	UC10	UC11
1	MonitorAdverseEventAction::getReports										
2	ViewPatientOfficeVisitHistoryAction::getPatients										
3	RemoteMonitoringDAO::getPatientsData										
4	sendMessage_jsp::jspService										
5	UpdateHospitalListAction::updateInformation										
6	ChangeSessionTimeoutAction::changeSessionTimeout			x							
7	PersonnelDAO::addEmptyPersonnel		x								
8	GetVisitRemindersAction::getImmunizationNeeders										
9	UpdateNDCodeListAction::addNDCode										
10	CPTCodesDAO::updateCode										
11	OfficeVisitDAO::update										x
12	PersonnelDAO::getPersonnel						x			x	
13	EmergencyReportAction::getPatientGender										
14	hospitalListing_jsp::jspService										
15	MonitorAdverseEventAction::getName										
16	HospitalsDAO::getAllHospitals										
17	EditRepresentativesAction::removeRepresentative										
18	RiskChecker::isAtRisk										
19	ViewMyRemoteMonitoringListAction::getPatientDataWithoutLogging										
20	UpdateHospitalListAction::addHospital										
21	AddRemoteMonitoringDataAction::addRemoteMonitoringData										
22	AllergyDAO::getAllergies								x		x
23	ViewMyRecordsAction::getRepresented										
24	ViewMyRecordsAction::getFamily										
25	ViewPrescriptionRenewalNeedsAction::getRenewalNeedsPatients										
26	AddPatientValidator::validate		x								
27	LOINCDAO::addLOINC										
28	EditPHRAction::getPatient										x
29											

+ - Edit 264 records. 0.4 seconds. Filter

首先在程序中导入上述矩阵

```
SimilarityMatrix matrix = Sqlite3.readSimilarityMatrixFromDB(Path.MATRIX_SCORE_DB);  
SimilarityMatrix oracle = Sqlite3.readSimilarityMatrixFromDB(Path.ORACLE_LITE_DB);
```

矩阵可以在控制台输出

```
System.out.println(" matrix = \n" + matrix );
```

结果：

```
AccessDA0::setSessionTimeoutMins UC8 0.279045850385826
AccessDA0::setSessionTimeoutMins UC3 0.168987072115835
AccessDA0::setSessionTimeoutMins UC5 0.0474097055692008
AccessDA0::setSessionTimeoutMins UC12 0.0378347753933195
AccessDA0::setSessionTimeoutMins UC9 0.0265362340455621
AccessDA0::setSessionTimeoutMins UC15 0.0193167577540458
AccessDA0::setSessionTimeoutMins UC30 0.00582387365887981
AccessDA0::setSessionTimeoutMins UC1 0.0
AccessDA0::setSessionTimeoutMins UC2 0.0
AccessDA0::setSessionTimeoutMins UC4 0.0
AccessDA0::setSessionTimeoutMins UC6 0.0
AccessDA0::setSessionTimeoutMins UC10 0.0
AccessDA0::setSessionTimeoutMins UC11 0.0
```

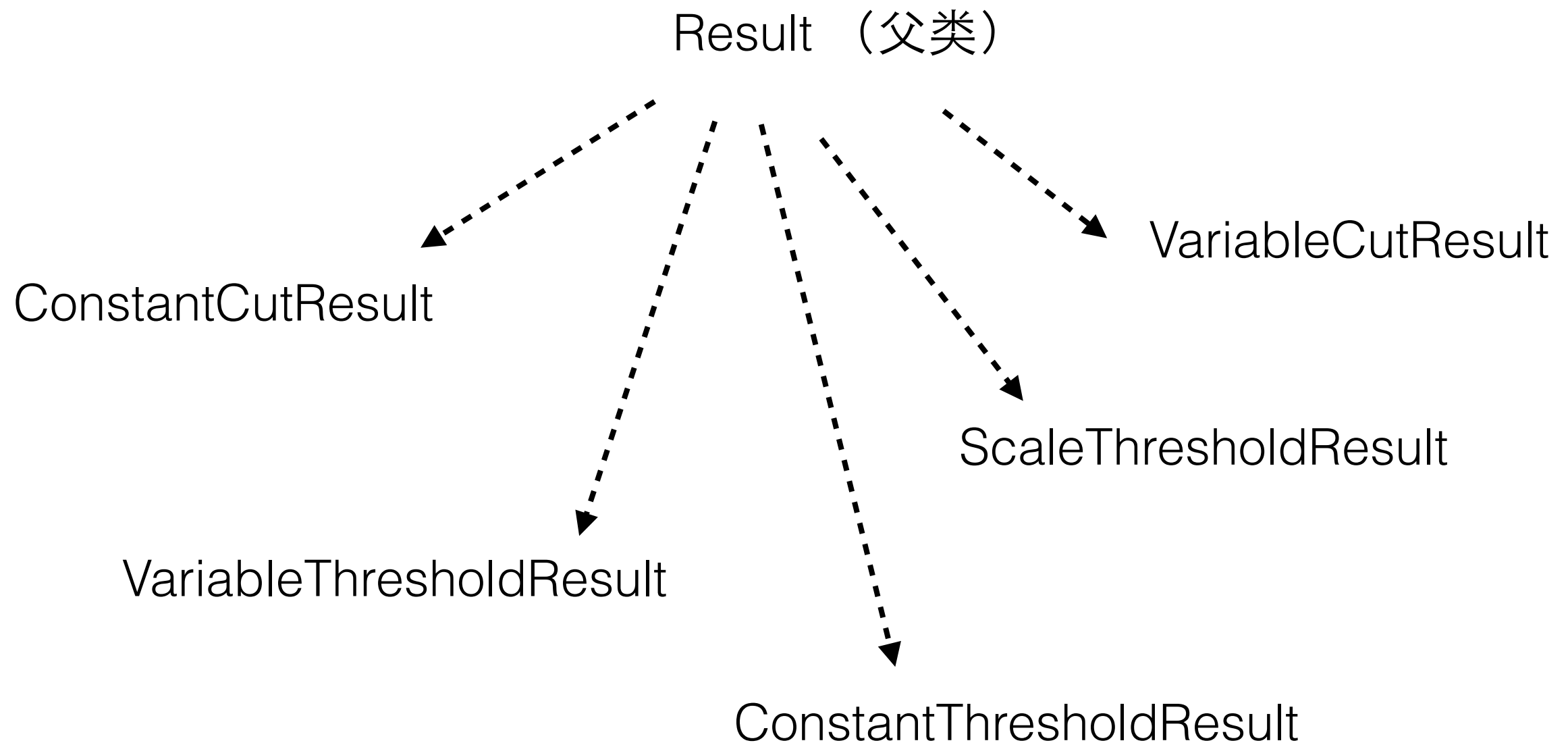
选择不同的Cut策略，并设置相应参数

```
MetricComputation metricComput = new MetricComputation(matrix, oracle);  
Result result = metricComput.compute(RankStrategy.CONSTANT_THRESHOLD);  
result.setArgument(0.1);
```


等价地，我们可以直接操作Result的子类型

```
MetricComputation metricComput = new MetricComputation(matrix, oracle);  
ConstantThresholdResult result =  
    (ConstantThresholdResult) metricComput.compute(RankStrategy.CONSTANT_THRESHOLD, 0.1);  
result.setThreshold(0.1);
```

我们一共提供了五种 Cut 方式



不同 Cut 方式的筛选结果 (By Query)

```
result.setArgument(0.1);  
result.showMatrix();
```

保留阈值大于0.1的追踪关系

结果:

```
matrix at constant threshold 0.1 =  
AccessDA0::setSessionTimeoutMins UC8 0.279045850385826  
AccessDA0::setSessionTimeoutMins UC3 0.168987072115835  
AccessDA0::setSessionTimeoutMins UC5 0.0  
AccessDA0::setSessionTimeoutMins UC12 0.0  
AccessDA0::setSessionTimeoutMins UC9 0.0  
AccessDA0::setSessionTimeoutMins UC15 0.0  
AccessDA0::setSessionTimeoutMins UC30 0.0  
AccessDA0::setSessionTimeoutMins UC1 0.0  
AccessDA0::setSessionTimeoutMins UC2 0.0  
AccessDA0::setSessionTimeoutMins UC4 0.0  
AccessDA0::setSessionTimeoutMins UC6 0.0  
AccessDA0::setSessionTimeoutMins UC10 0.0  
AccessDA0::setSessionTimeoutMins UC11 0.0  
AccessDA0::setSessionTimeoutMins UC13 0.0  
AccessDA0::setSessionTimeoutMins UC16 0.0  
AccessDA0::setSessionTimeoutMins UC17 0.0  
AccessDA0::setSessionTimeoutMins UC18 0.0  
AccessDA0::setSessionTimeoutMins UC19 0.0  
AccessDA0::setSessionTimeoutMins UC21 0.0
```

评价指标的计算分为两类

- By Ranklist
- By Query

相关方法

- get 系列 - 返回指标的数值
- show 系列 - 控制台显示指标

Metrics By Query

```
result.setArgument(0.1);  
result.showPrecisionRecallCurve();
```

结果：

Precision by each query at constant threshold 0.1

```
MonitorAdverseEventAction::getReports: 0.14285714285714285  
ViewPatientOfficeVisitHistoryAction::getPatients: 0.14285714285714285  
RemoteMonitoringDAO::getPatientsData: 0.2  
sendMessage_jsp::_jspService: 0.3333333333333333  
UpdateHospitalListAction::updateInformation: 0.3333333333333333  
ChangeSessionTimeoutAction::changeSessionTimeout: 0.3333333333333333  
PersonnelDAO::addEmptyPersonnel: 0.25  
GetVisitRemindersAction::getImmunizationNeeders: 0.0  
UpdateNDCCodeListAction::addNDCCode: 0.5  
CPTCodesDAO::updateCode: 0.5  
OfficeVisitDAO::update: 0.14285714285714285  
PersonnelDAO::getPersonnel: 0.25  
EmergencyReportAction::getPatientGender: 0.16666666666666666  
hospitalListing_jsp::_jspService: 0.5  
MonitorAdverseEventAction::getName: 0.3333333333333333  
HospitalsDAO::getAllHospitals: 0.0  
EditRepresentativesAction::removeRepresentative: 0.16666666666666666  
RiskChecker::isAtRisk: 1.0  
ViewMyRemoteMonitoringListAction::getPatientDataWithoutLogging: 0.125  
UpdateHospitalListAction::addHospital: 0.3333333333333333  
AddRemoteMonitoringDataAction::addRemoteMonitoringData: 0.5
```

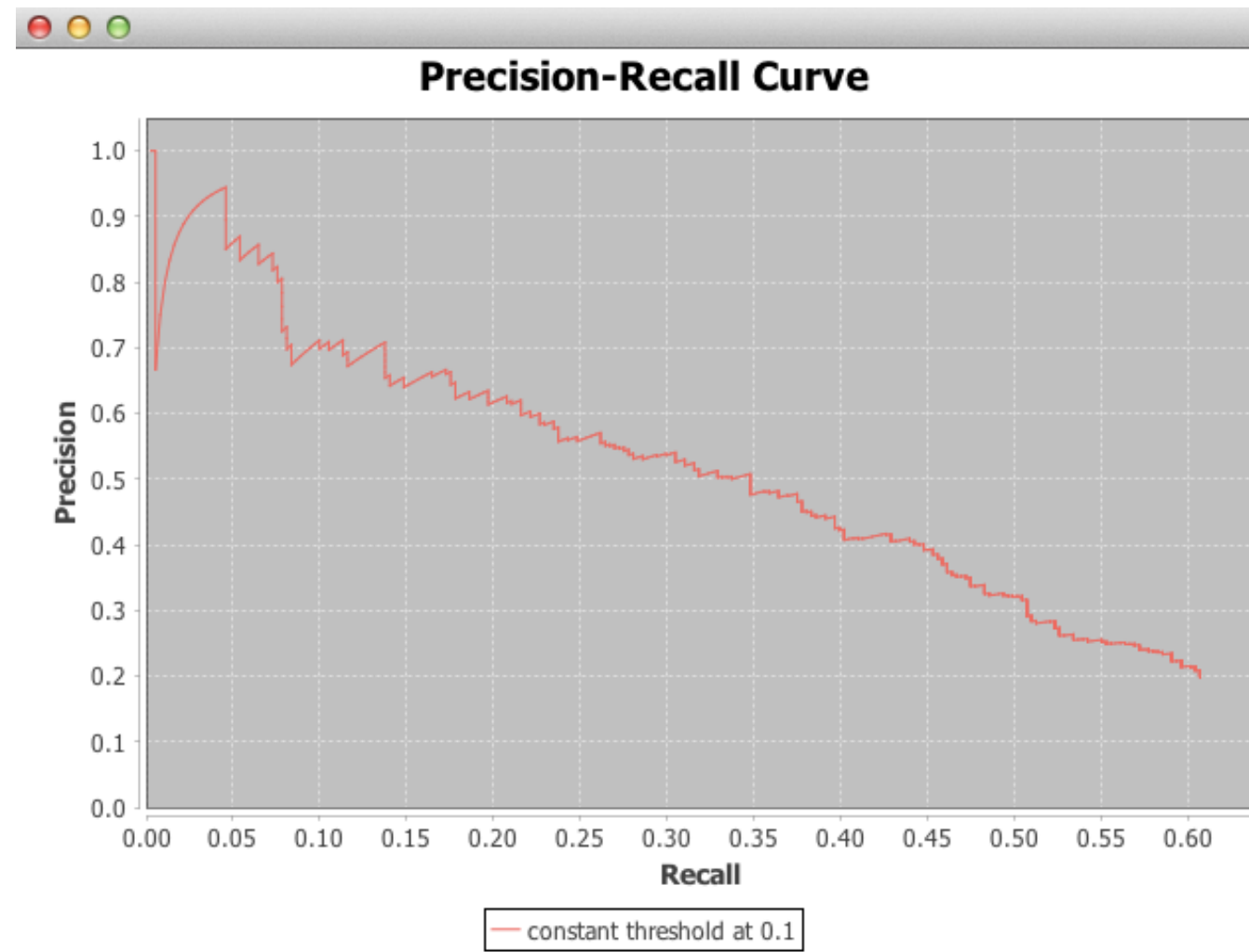
其他指标：

```
result.showPrecisionByRanklist();  
result.showMeanAveragePrecisionByQuery();  
result.showMeanAveragePrecisionByQuery();
```

Metrics By Ranklist

```
result.setArgument(0.1);  
result.showPrecisionRecallCurve();
```

结果：



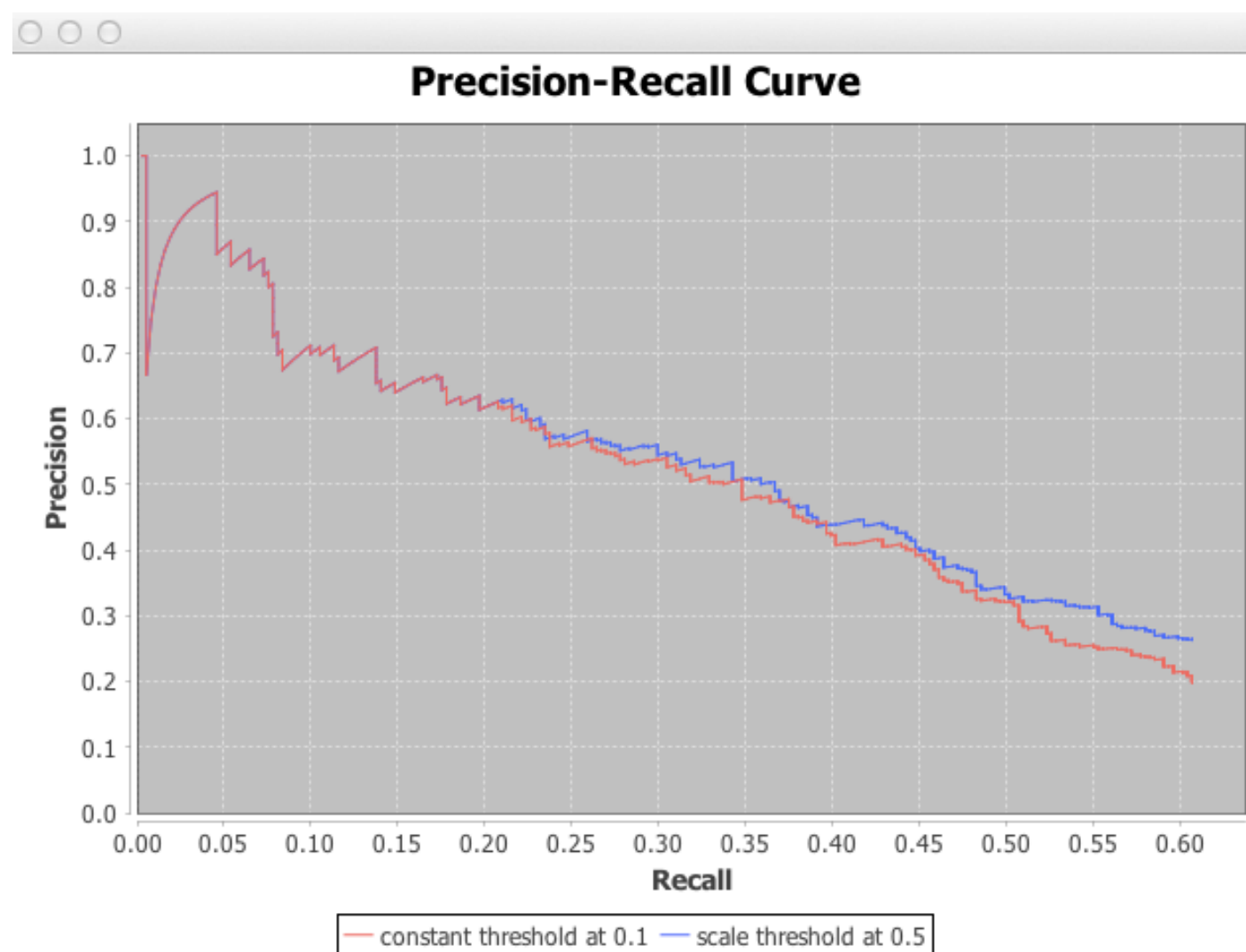
其他指标：

```
result.showPrecisionByRanklist();  
result.showRecallByRanklist();  
result.showAveragePrecisionByRanklist();
```

进阶展示：Curve 中显示多条折现

```
PrecisionRecallChart chart = new PrecisionRecallChart();  
chart.addLine(result);
```

```
Result scaleThresholdResult = metricComput.compute(RankStrategy.SCALE_THRESHOLD, 0.3);  
chart.addLine(scaleThresholdResult);  
chart.showChart();
```



END