بسم الله الرحمن الرحيم

سرطان روده بزرگ (Colon Cancer)

پروژه درس داده کاوی

استاد درس: دکتر الهام عباسی

اسفند ۹۹

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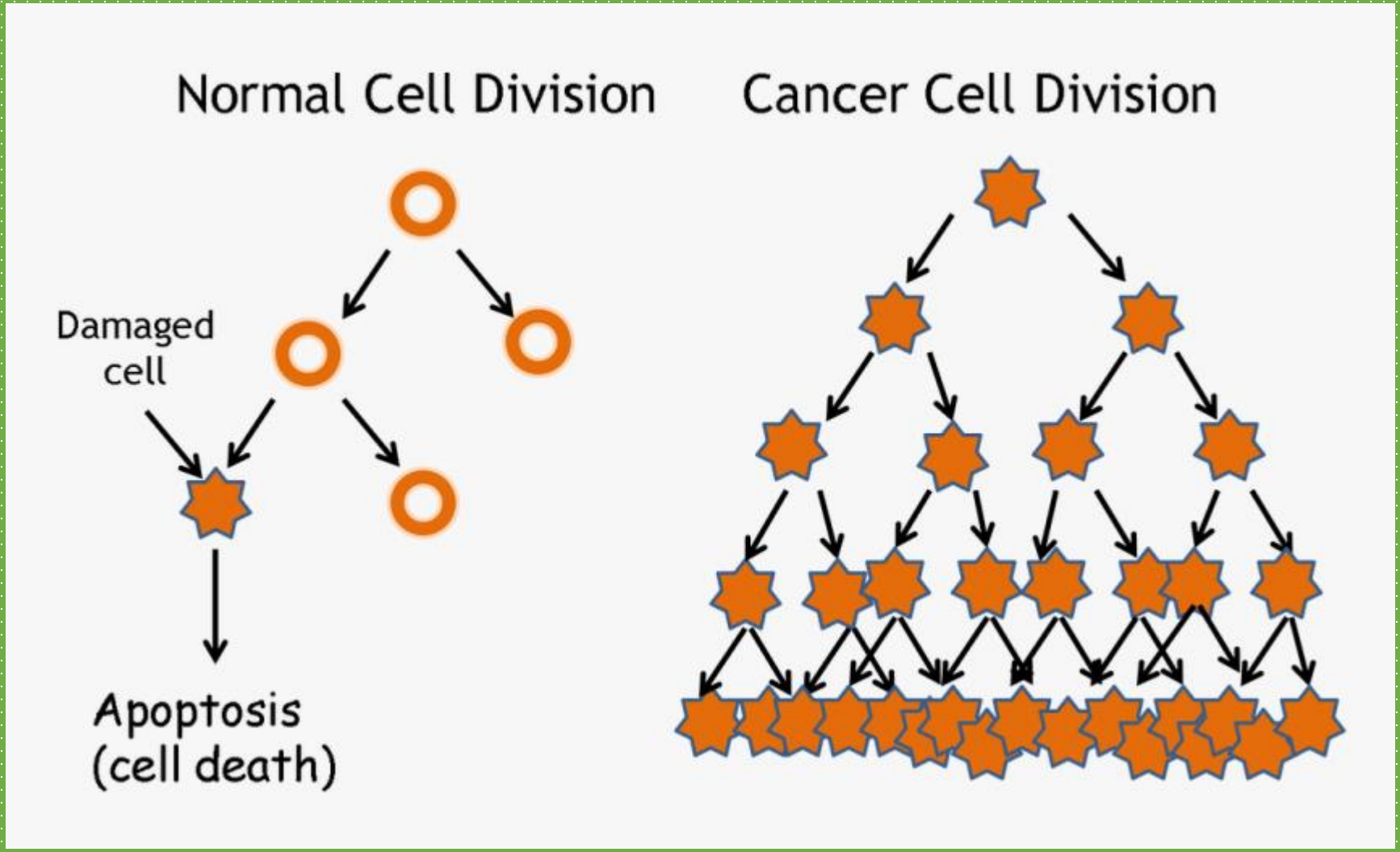
داده
data
پیش‌پردازش
preprocessing
مدل
Model
ارزیابی
Evaluation

سرطان چیست؟


Normal Cell Division
Cancer Cell Division
Damaged cell
Apoptosis (cell death)

سرطان روده بزرگ

TABLE 1. New Cases and Deaths for 36 Cancers and All Cancers Combined in 2020

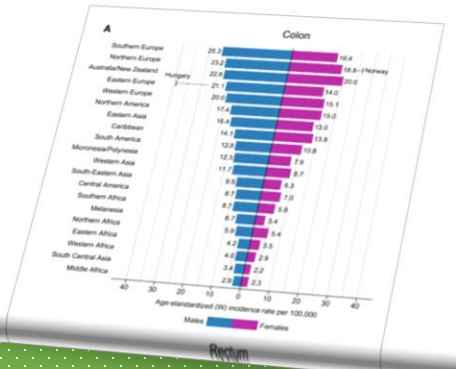
CANCER SITE	NO. OF NEW CASES (% OF ALL SITES)		NO. OF NEW DEATHS (% OF ALL SITES)	
Female breast	2,261,419	(11.7)	684,996	(6.9)
Lung	2,206,771	(11.4)	1,796,144	(18.0)
Prostate	1,414,259	(7.3)	375,304	(3.8)
Nonmelanoma of skin [a]	1,198,073	(6.2)	63,731	(0.6)
Colon	1,148,515	(6.0)	576,858	(5.8)
Stomach	1,089,103	(5.6)	768,793	(7.7)
Liver	905,677	(4.7)	830,180	(8.3)
Rectum	732,210	(3.8)	339,022	(3.4)
Cervix uteri	604,127	(3.1)	341,831	(3.4)
Esophagus	604,100	(3.1)	544,076	(5.5)
Thyroid	586,202	(3.0)	43,646	(0.4)
Bladder	573,278	(3.0)	212,536	(2.1)
Non-Hodgkin lymphoma	544,352	(2.8)	259,793	(2.6)
Pancreas	495,773	(2.6)	466,003	(4.7)
Leukemia	474.519	(2.5)	311.594	(3.1)
All sites excluding nonmelanoma skin	18,094,716		9,894,402	
All sites	19,292,789		9,958,133	

...rectal cancer can be considered a marker of socioeconomic development, and, in ...countries undergoing major transition, incidence rates tend to rise uniformly with increasing HDI.[92, 93] Incidence rates have been steadily rising in many countries in Eastern Europe, South Eastern and South Central Asia, and South America.[22, 94] The increase in formerly low-risk and lower HDI countries likely reflects changes in lifestyle factors and diet, ie, shifts toward an increased intake of animal-source foods and a more sedentary lifestyle, leading to decreased physical activity and increased prevalence of excess body weight, which are independently associated with colorectal cancer risk.[95] Additional risk factors include heavy alcohol consumption, cigarette smoking, and consumption of red or processed meat, whereas calcium supplements and adequate consumption of whole grains ... products appear to decrease risk.[96] Primary prevention remains ... the increasing global burden of colorectal cancer. The expens... screening effort in most LMICs is not currently justified giver... colonoscopy and inadequate implementation of diagnostic... evidence, however, suggests that colorectal cancer screeni... invasive methods (guaiac testing and fecal immunochemic... least in some settings of emerging economies, and offer o... burden of the disease.[97, 98]

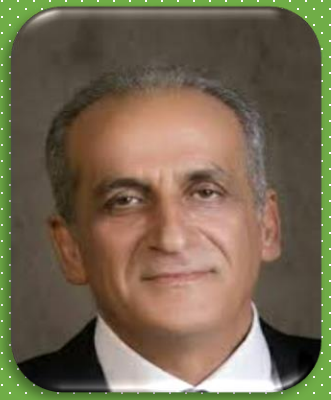
Declines in colorectal cancer incidence in some high-incid... attributed to population-level changes toward healthier l... smoking) and the uptake of screening,[94, 99] although acc... 2000s is chiefly attributed to increased colonoscopy scre... lesions.[100-102] However, favorable trends for adults age... early-onset colorectal cancer (age at diagnosis <50 year... ...nited States, Canada, Australia, and 6 other high-inco... ...4% per year.[103-105] Although rising incidence in y...

Colorectal cancer

More than 1.9 million new colorectal cancer (including anus) cases and 935,000 deaths were estimated to occur in 2020, representing about one in 10 cancer cases and deaths (Table 1). Overall, colorectal ranks third in terms of incidence, but second in terms of mortality (Fig. 4). Incidence rates are approximately 4-fold higher in transitioned countries compared with transitioning countries, but there is less variation in the mortality rates because of higher fatality in transitioning countries (Fig. 7). There is an approximately 9-fold variation in colon cancer incidence rates by world regions, with the highest rates in European regions, Australia/New Zealand, and Northern America, with Hungary and Norway ranking first in men and women, respectively (Fig. 10A). Rectal cancer incidence rates have a similar regional distribution, although rates in Eastern Asia rank among the highest (Fig. 10B). Rates of both colon and rectal cancer incidence tend to be low in most regions of Africa and in South Central Asia.



دانش ما و سرطان



مکتب‌خونه

ریاضیات سرطان

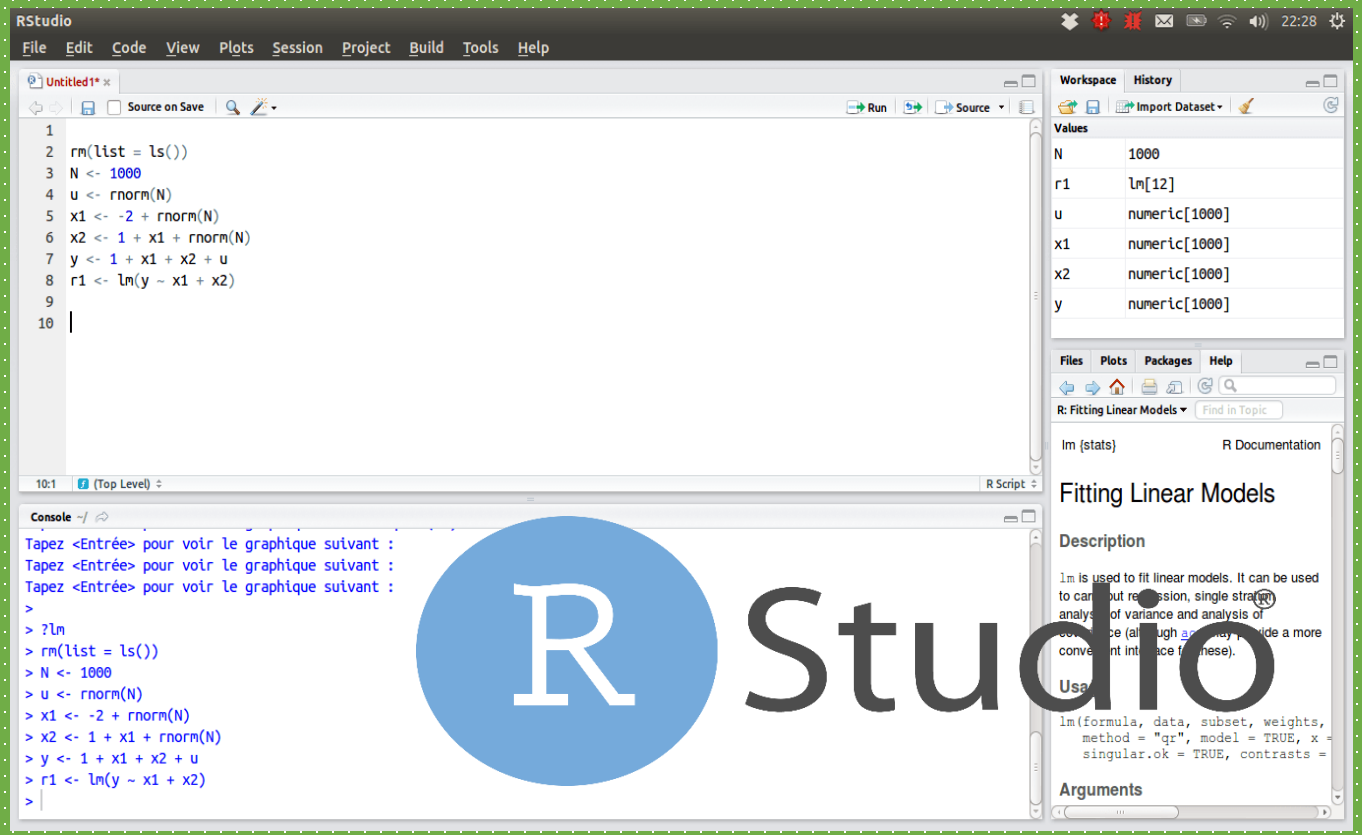
۸۲٪ (۲۹ رای)

ثبت‌نام رایگان

نمایش تیزر

زبان برنامه نویسی R

- ابزار کار
- خواندن داده
- پیش پردازش
- مدلسازی
- ارزیابی
- ارائه



- ابزار کار
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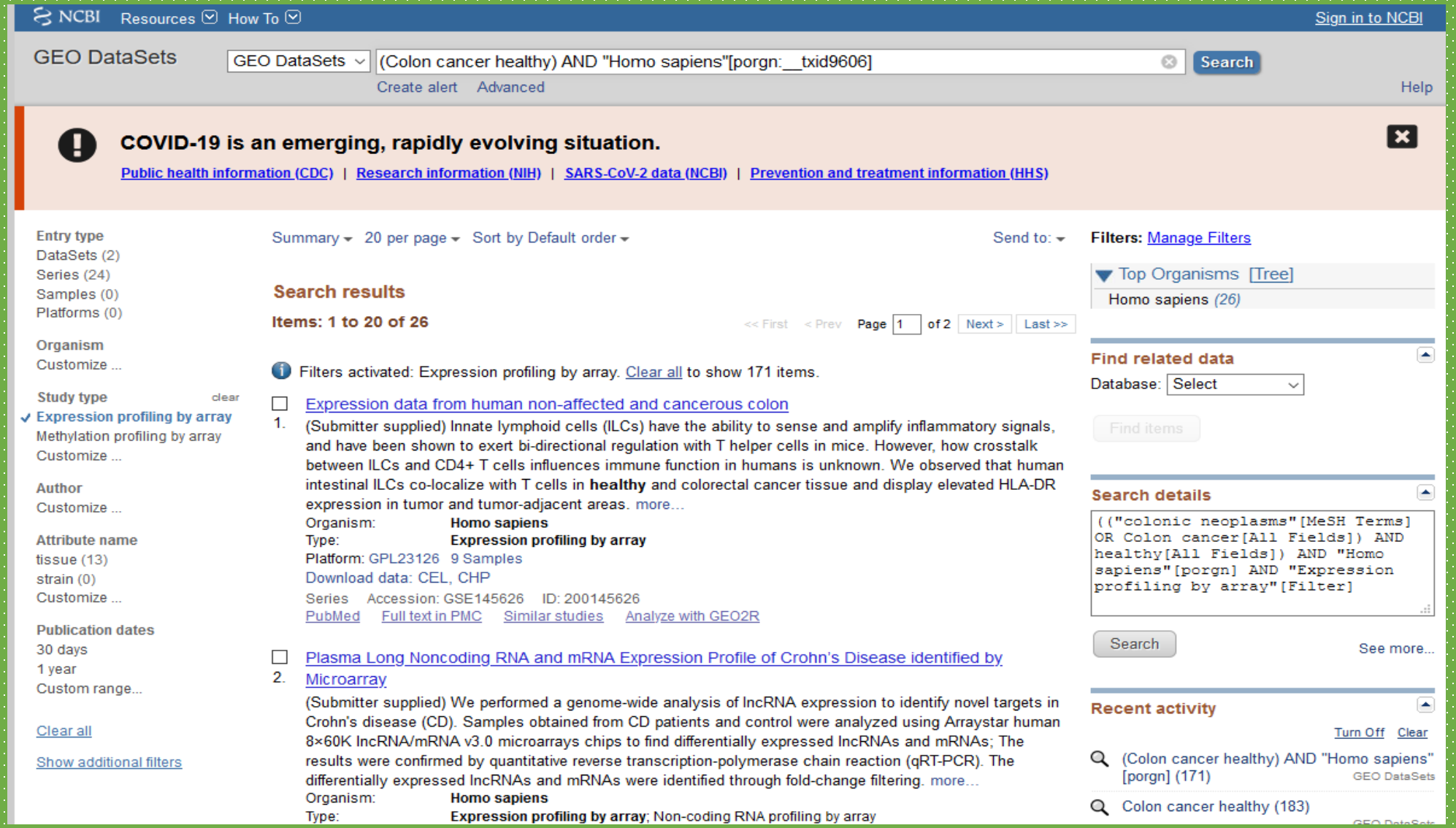
- ارائه

National Center for Biotechnology Information (NCBI)

خواندن داده



- ابزار کار
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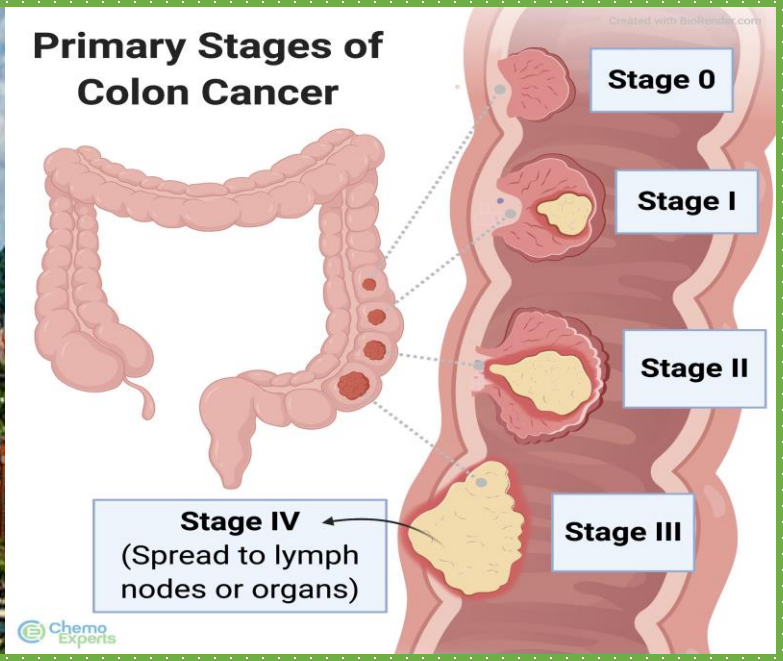
- ارزیابی
- ارائه

National Taiwan University

خواندن داده



colon-cancer

- Source: [AU99a]
- Preprocessing: Instance-wise normalization to mean zero and variance one. Then feature-wise normalization to mean zero and variance one. [SKS03a]
- # of classes: 2
- # of data: 62
- # of features: 2,000
- Files:
  - colon-cancer.bz2

Cancer ~ 2000 Gene Expression

- ابزار کار
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- ارزیابی
- ارائه

پیش پردازش

داده های نرمال و هم توزیع شده

C:\Users\shamsollah\Downloads\Data Mining\Project\colon-cancer - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

change.log | web.xml | context.xml | DK_predict.py | KNN.py | SecondaryStruct.py | DecisionTree.py | PebblesGame.java | ColonCancer.R | note 1.Rmd | colon-cancer

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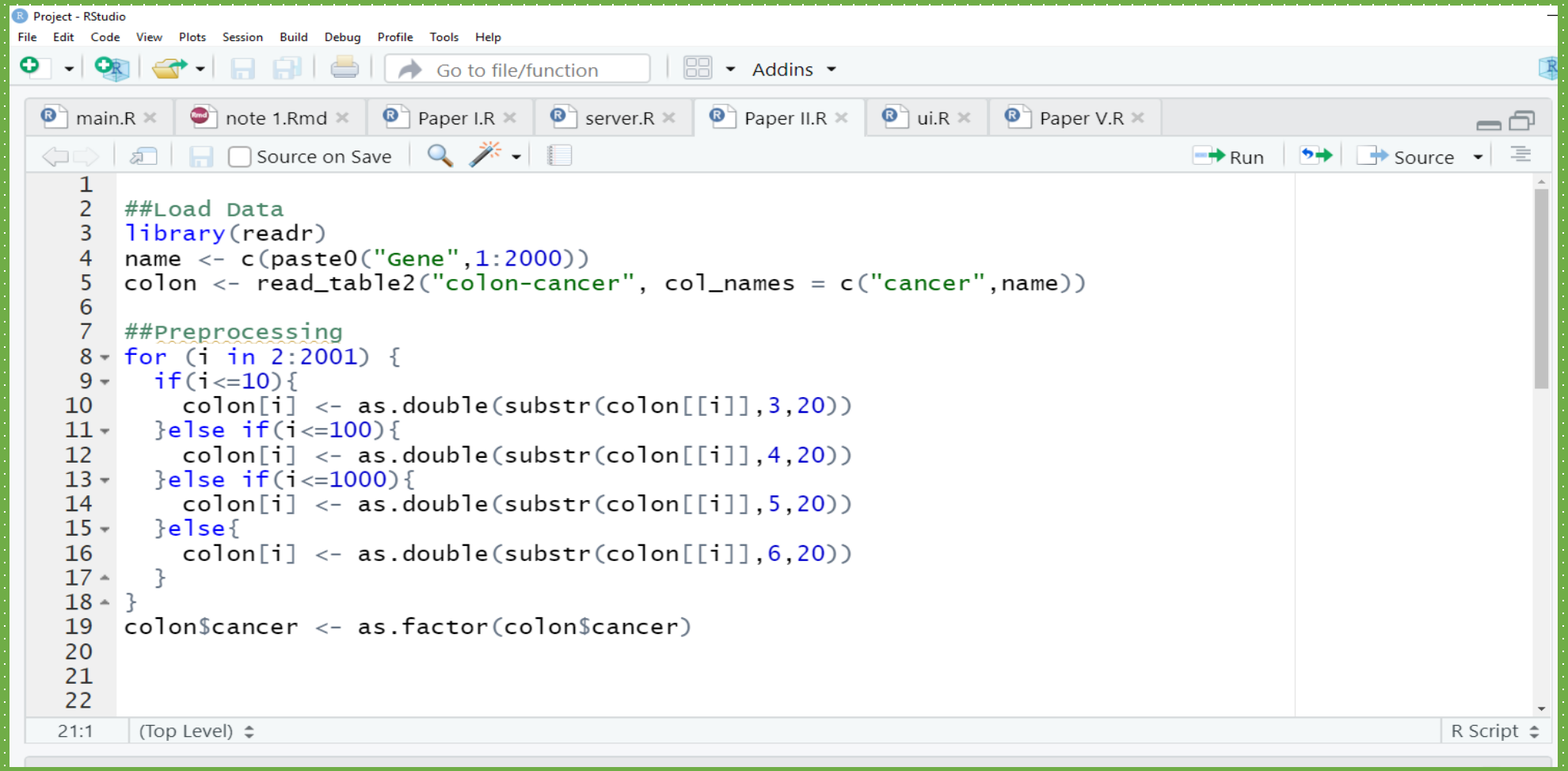
پیش پردازش

اصلاح عددها و تبدیل cancer به فاکتور

- ابزار کار
- خواندن داده
- پیش پردازش
- مدلسازی
- ارزیابی
- ارائه



- ابزار کار
- خواندن داده
- پیش پردازش
- مدلسازی
- ارزیابی
- ارائه

پیش پردازش

اصلاح عددها و تبدیل cancer به فاکتور

Project - RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function | Addins

main.R | note 1.Rmd | Paper I.R | server.R | Paper II.R | colon | ui.R | Paper V.R

Filter | Cols: « < 1 - 50 > »

	cancer	Gene1	Gene2	Gene3	Gene4	Gene5	Gene6	Gene7	Gene8	Gene9	Gene10	Gene11	Gen
1	-1	2.080750	1.099070	0.927763	1.029080	-0.130763	1.265460	-0.436286	0.728881	2.107980	1.359870	0.265471	
2	1	1.109460	0.786453	0.445560	-0.146323	-0.996316	0.555759	0.290734	-0.145259	1.132660	0.559093	-1.469130	
3	-1	-0.676530	1.693100	1.559250	1.559980	-0.982179	-1.358510	-1.313990	-0.455067	0.295214	0.290694	0.415632	
4	1	0.534396	1.677540	1.489030	0.778605	-0.183776	-1.116850	-1.487560	-0.579511	0.292683	1.345480	-0.687898	
5	-1	-1.018900	0.511080	0.755641	1.013820	0.529899	0.160440	-0.087055	1.295290	0.458736	0.714082	0.727290	
6	1	-1.185370	-0.514473	-0.566634	1.224720	0.619244	-0.684713	-0.798129	1.368770	-0.697007	-1.006190	0.808748	
7	-1	1.779050	0.423947	0.820696	2.525690	0.666921	0.661346	0.425365	0.165247	1.967910	1.140080	-0.779230	
8	1	-0.889638	-0.315453	-0.073131	1.157500	-0.311039	-0.364472	-1.621640	1.193000	0.689805	0.203786	1.907460	
9	-1	-0.659694	-0.184388	-0.540022	1.122420	0.562609	-2.988310	-2.349810	-1.325010	-0.017002	0.109081	1.907460	
10	1	-1.225800	-0.212615	-0.588923	1.335410	-0.356505	0.354394	0.699607	0.190782	-0.139117	-0.551846	0.292320	
11	-1	-0.377282	-2.620490	-2.763910	0.612038	-0.155718	-1.456070	0.683292	-1.031570	0.718861	-2.313070	-0.092949	
12	1	1.639210	0.663551	0.324924	1.456460	-0.170587	-0.443486	-0.832590	-0.928334	1.320070	0.591865	0.158091	

Showing 1 to 13 of 62 entries, 2001 total columns

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مدلسازی

Paper I
- Breast and Colon Cancer Classification from Gene Expression Profiles Using Data Mining Techniques
- GW, IG, SVM

Paper II
- Detection of colon cancer based on microarray dataset using machine learning as a feature selection and classification techniques
- RF, MDA, MDG, CV, Ensemble

Paper III
- Examining Applying High Performance Genetic Data Feature Selection and Classification Algorithms for Colon Cancer Diagnosis
- PSO, SVM

Paper IV
- Naïve Bayes Classifier Models for Predicting the
- Colon Cancer
- Naïve Bayes

Paper V
- Statistical Characterization and Classification of Colon Microarray Gene Expression Data using Multiple Machine Learning Paradigms
- Jack of all trades!

Packages
- Advanced Bioinformatics
- Special Packages in R

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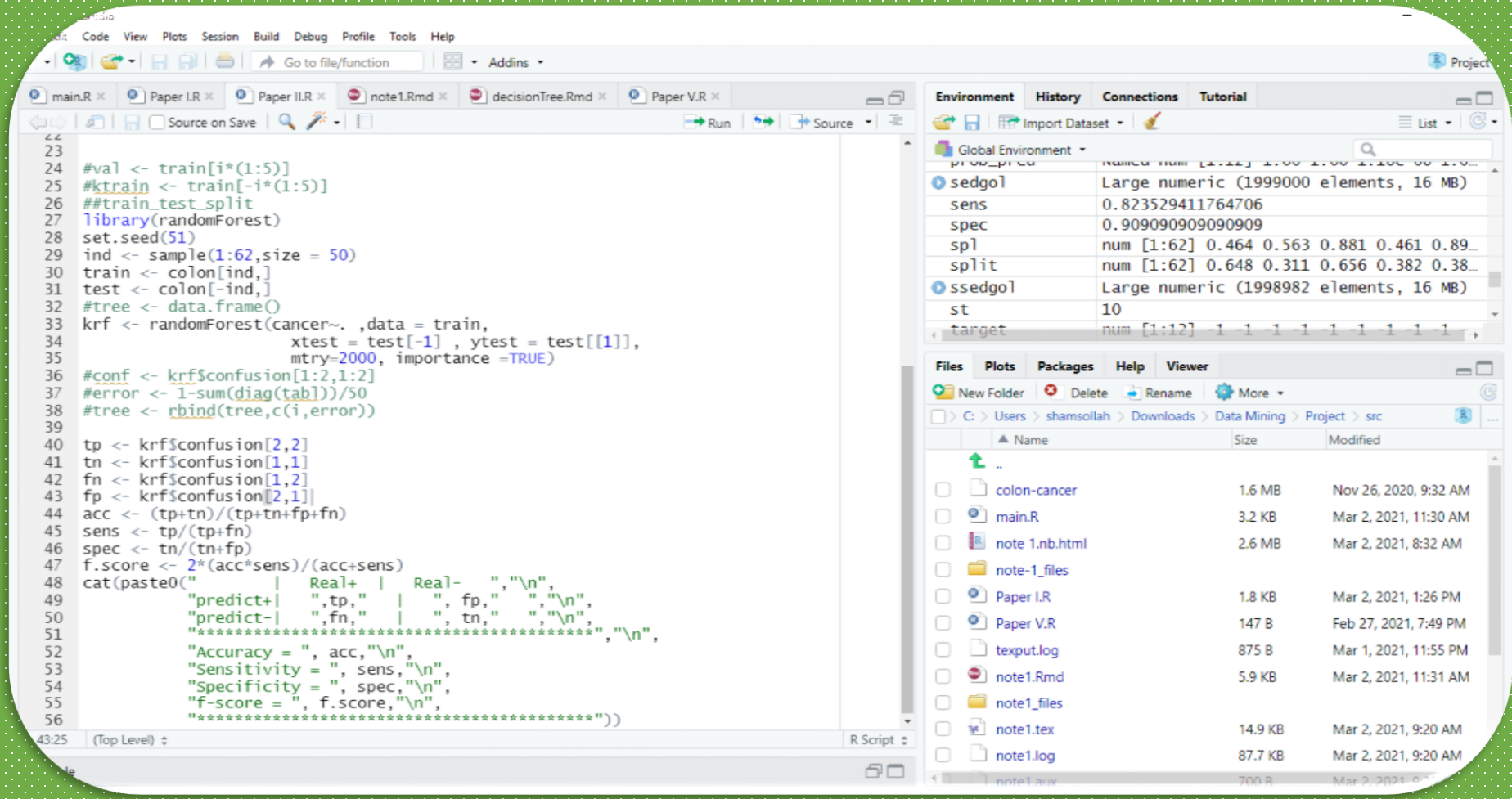
مدلسازی

- Detection of colon cancer based on microarray dataset using machine learning as a feature selection and classification techniques
- RF, MDA, MDG, CV, Ensemble



مدلسازی

- Naïve Bayes Classifier Models for Predicting the Colon Cancer
- Naïve Bayes

فاعده بیز

$$\Pr(C|X) = \frac{\Pr(X|C)\Pr(C)}{\Pr(X)}$$

که با جایگذاری ویژگی ها به جای X به فرمول زیر می رسیم:

$$\Pr(C|x_1, x_2, \ldots, x_{2000}) = \frac{\Pr(x_1, x_2, \ldots, x_{2000}|C)\Pr(C)}{\Pr(x_1, x_2, \ldots, x_{2000})}$$

با فرض استقلال هر دو ویژگی از هم داریم:

$$\Pr(C|x_1, x_2, \ldots, x_{2000}) = \Pr(C)\Pi_{i=1}^{2000}\Pr(x_i|C)$$

تا اینجا همه چیز مطابق چیزی بود که در درس داشتیم اما قسمت متفاوت رفتار با داده های پیوسته است که پیشنهاد مقاله این است که برای آنها احتمال شرطی را به صورت زیر حساب می کنیم:

$$\Pr(X_i = x_i|C = c_j) = \frac{1}{\sqrt{2\pi}\sigma}\exp\left(-\frac{(x_i - \mu)^2}{2\sigma^2}\right)$$

حال می توانیم دست به کد شویم:

مدلسازی

- Naïve Bayes Classifier Models for Predicting the Colon Cancer
- Naïve Bayes

```
cancer probability
cprob <- sum(train$cancer==1)/dim(train)[1]
hprob <- 1-cprob
ctrain <- subset(train,train$cancer==1)
htrain <- subset(train,train$cancer==-1)
hmean <- sapply(htrain[,2:2001], mean)
hsd <- sapply(htrain[,2:2001], sd)
cmean <- sapply(ctrain[,2:2001], mean)
csd <- sapply(ctrain[,2:2001], sd)
target = c()
for (i in 1:nrow(test)) {
p1 = cprob
p2 = hprob
  for (j in 1:2000) {
    p1 = p1*dnorm(test[[i,j+1]],cmean[j],csd[j],log = F)
    p2 = p2*dnorm(test[[i,j+1]],hmean[j],hsd[j],log = F)
  }
if(p1>p2){
  target = c(target,1)
}else{
  target = c(target,-1)
}
```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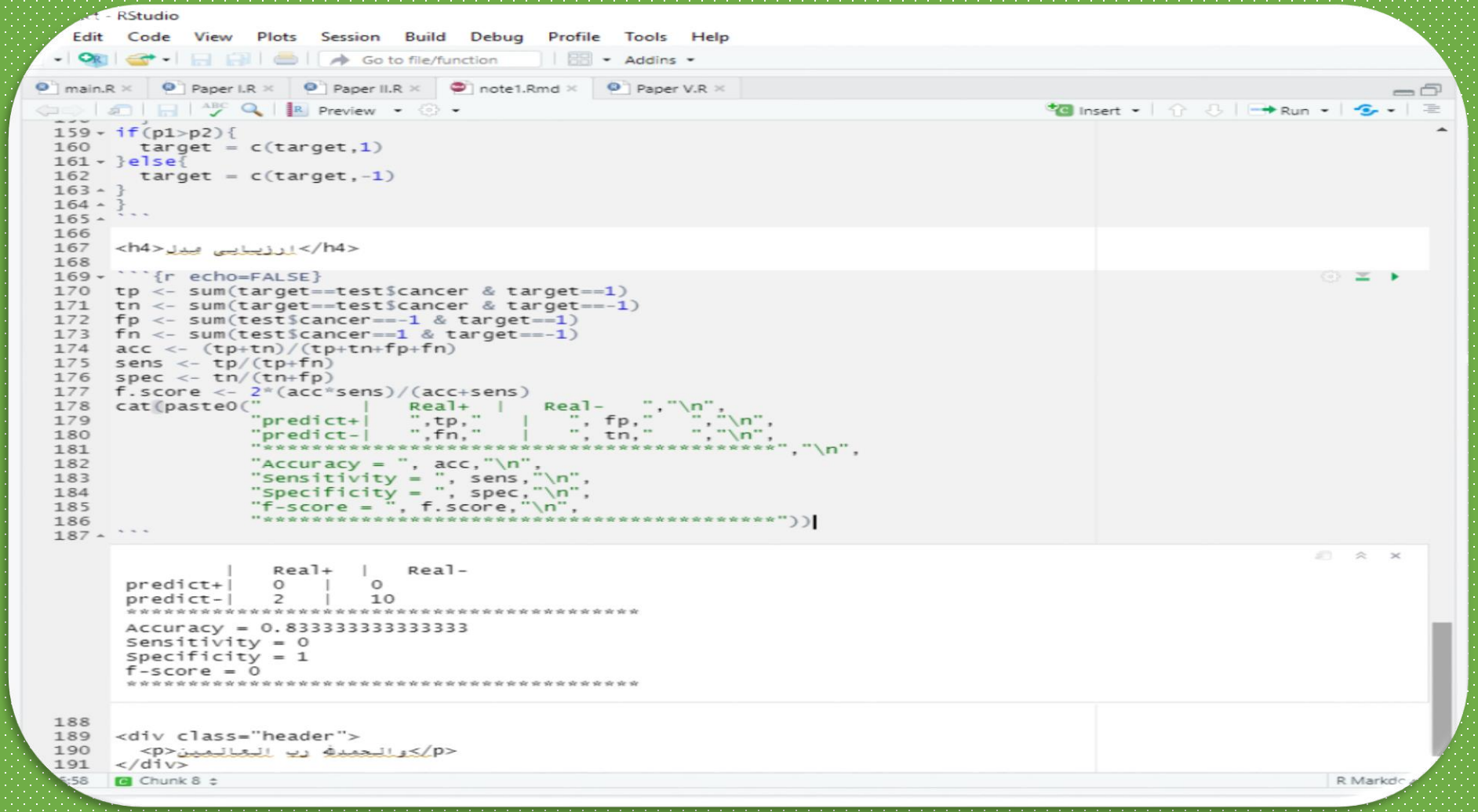
مدلسازی

- Naïve Bayes Classifier Models for Predicting the Colon Cancer
- Naïve Bayes



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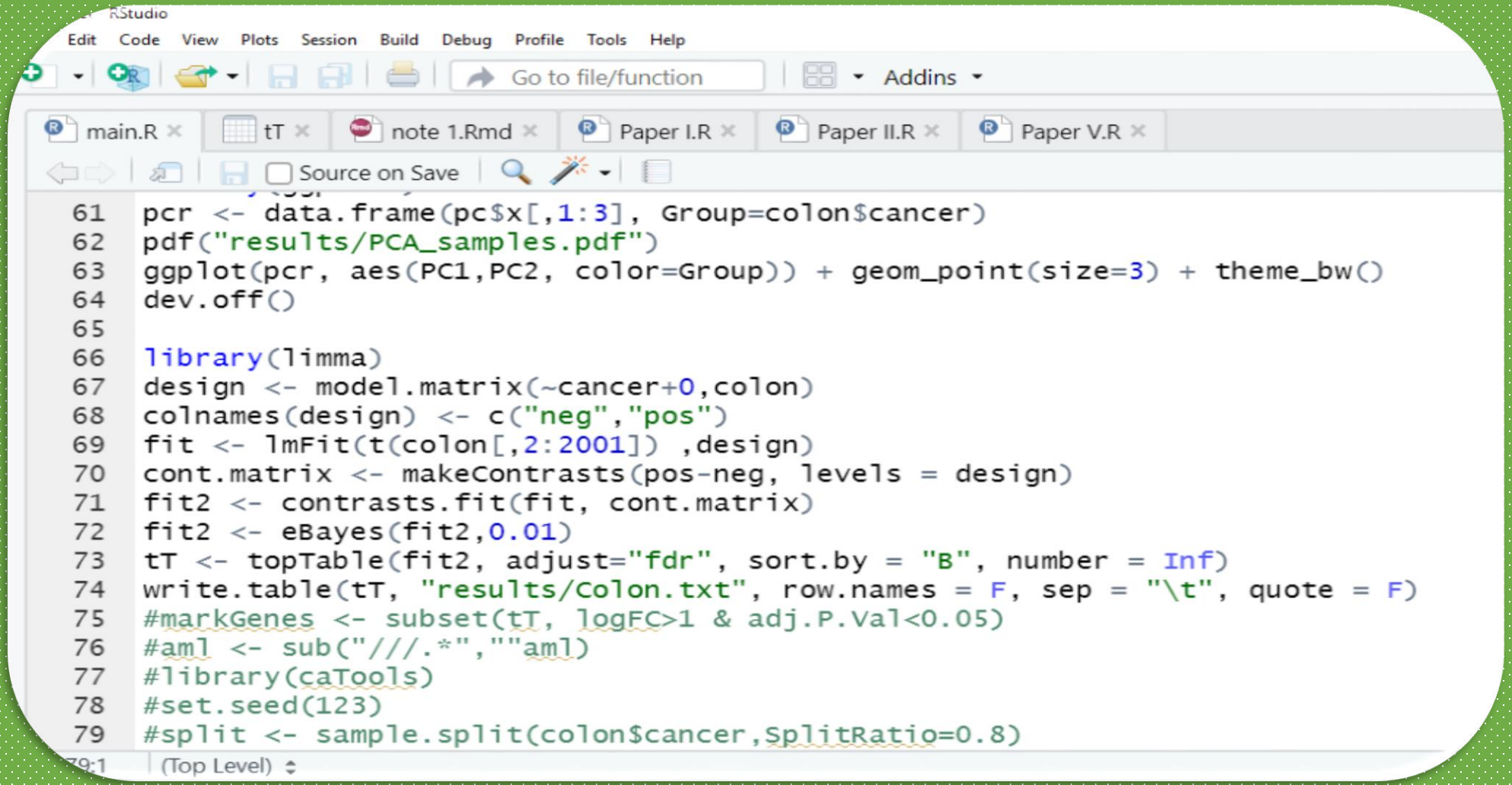

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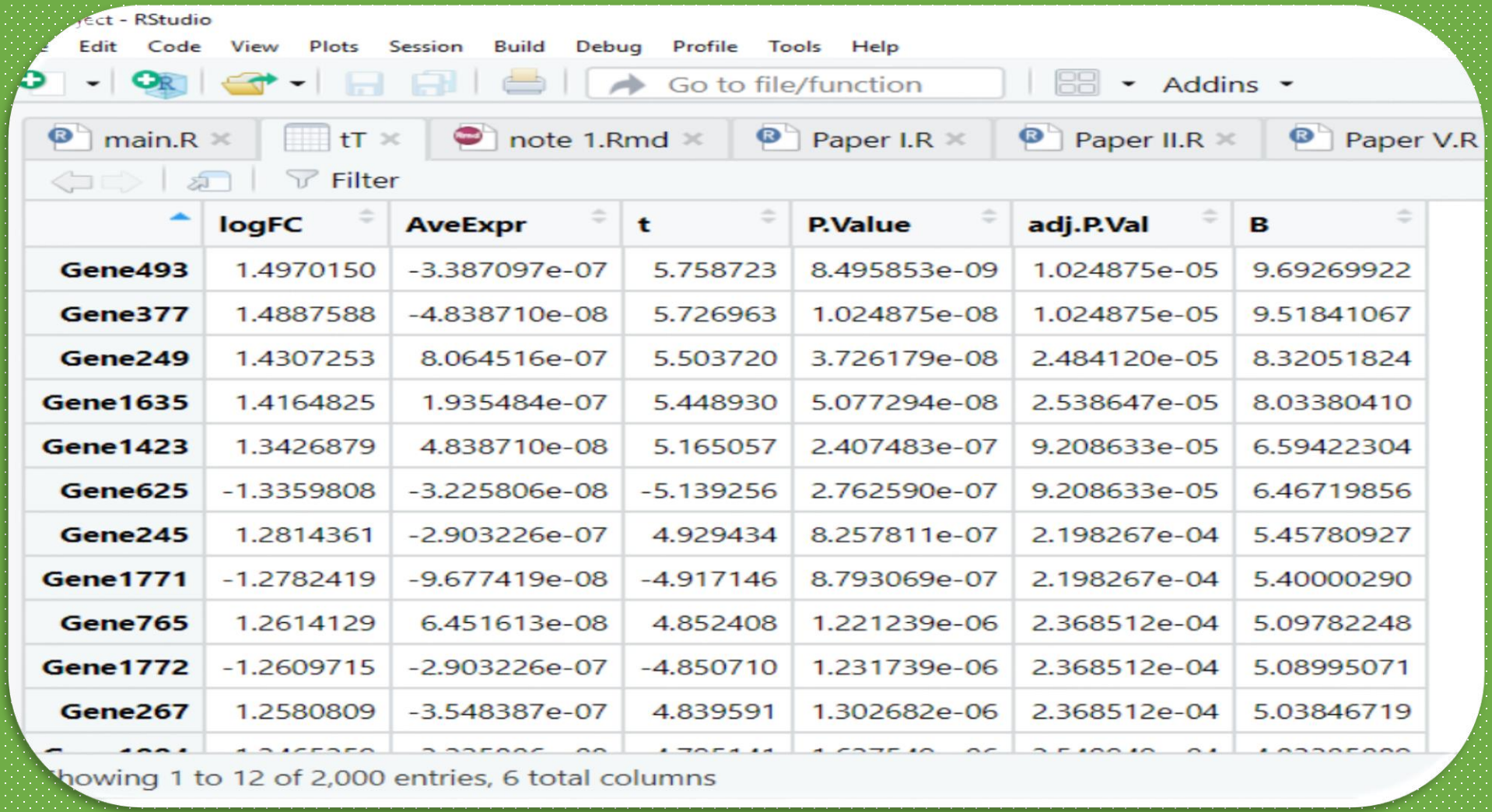

	logFC	AveExpr	t	P.Value	adj.P.Val	B
Gene493	1.4970150	-3.387097e-07	5.758723	8.495853e-09	1.024875e-05	9.69269922
Gene377	1.4887588	-4.838710e-08	5.726963	1.024875e-08	1.024875e-05	9.51841067
Gene249	1.4307253	8.064516e-07	5.503720	3.726179e-08	2.484120e-05	8.32051824
Gene1635	1.4164825	1.935484e-07	5.448930	5.077294e-08	2.538647e-05	8.03380410
Gene1423	1.3426879	4.838710e-08	5.165057	2.407483e-07	9.208633e-05	6.59422304
Gene625	-1.3359808	-3.225806e-08	-5.139256	2.762590e-07	9.208633e-05	6.46719856
Gene245	1.2814361	-2.903226e-07	4.929434	8.257811e-07	2.198267e-04	5.45780927
Gene1771	-1.2782419	-9.677419e-08	-4.917146	8.793069e-07	2.198267e-04	5.40000290
Gene765	1.2614129	6.451613e-08	4.852408	1.221239e-06	2.368512e-04	5.09782248
Gene1772	-1.2609715	-2.903226e-07	-4.850710	1.231739e-06	2.368512e-04	5.08995071
Gene267	1.2580809	-3.548387e-07	4.839591	1.302682e-06	2.368512e-04	5.03846719

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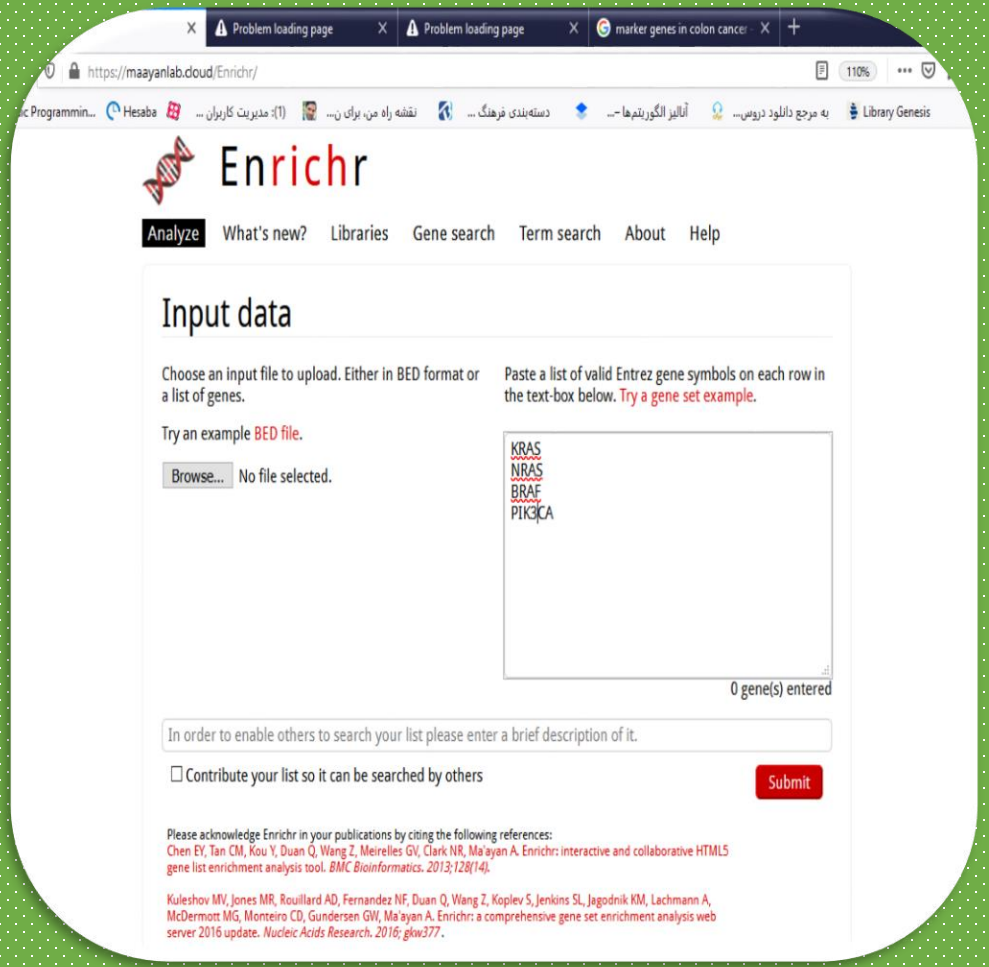

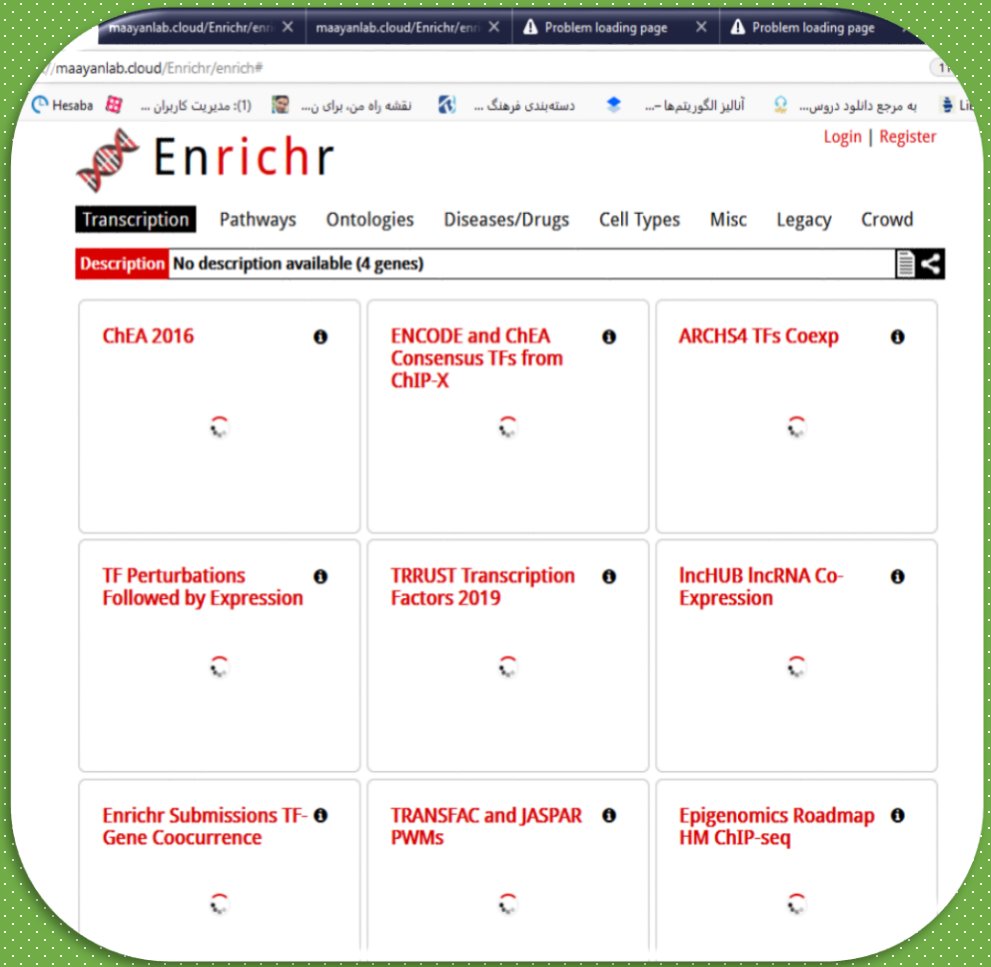

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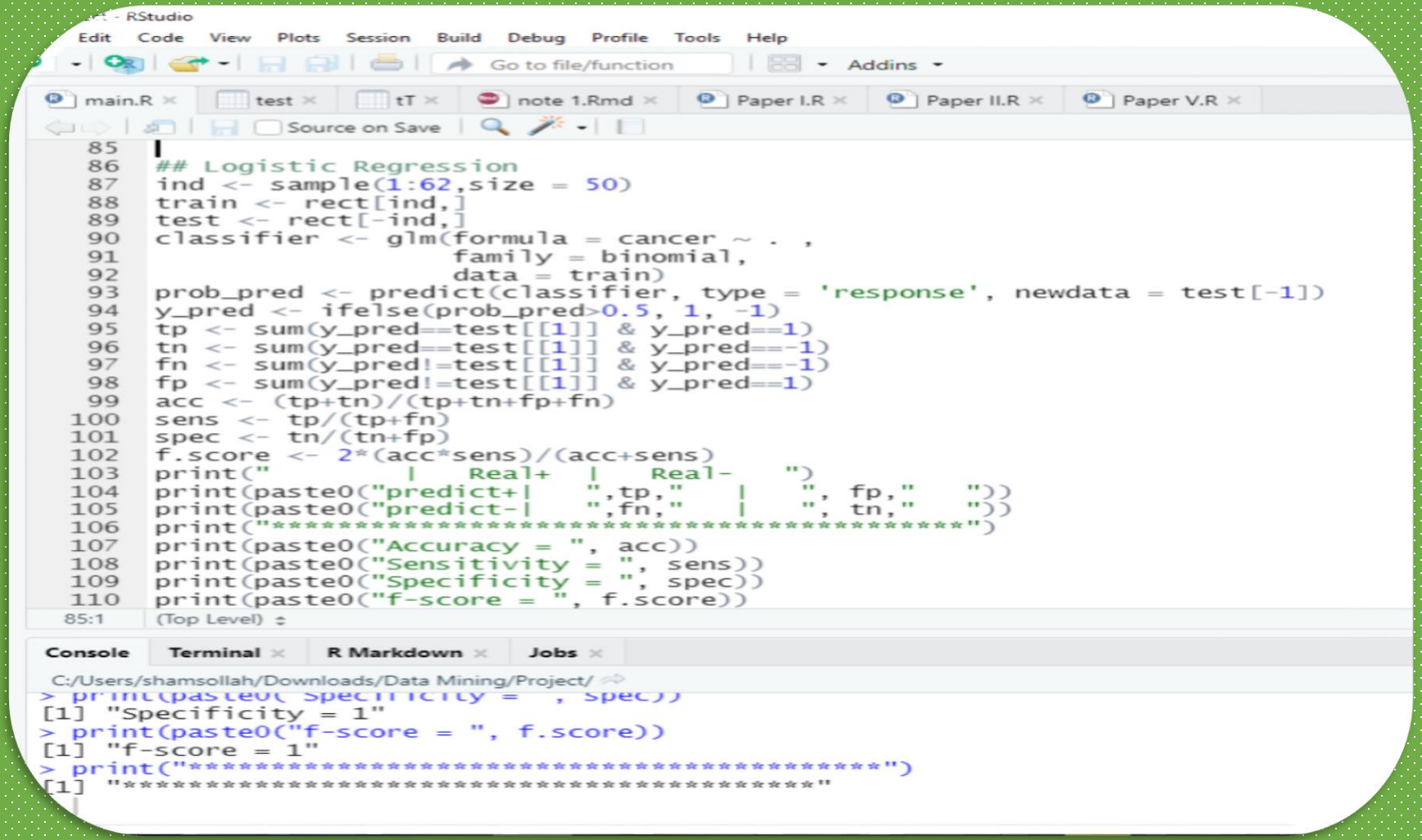

ارزیابی

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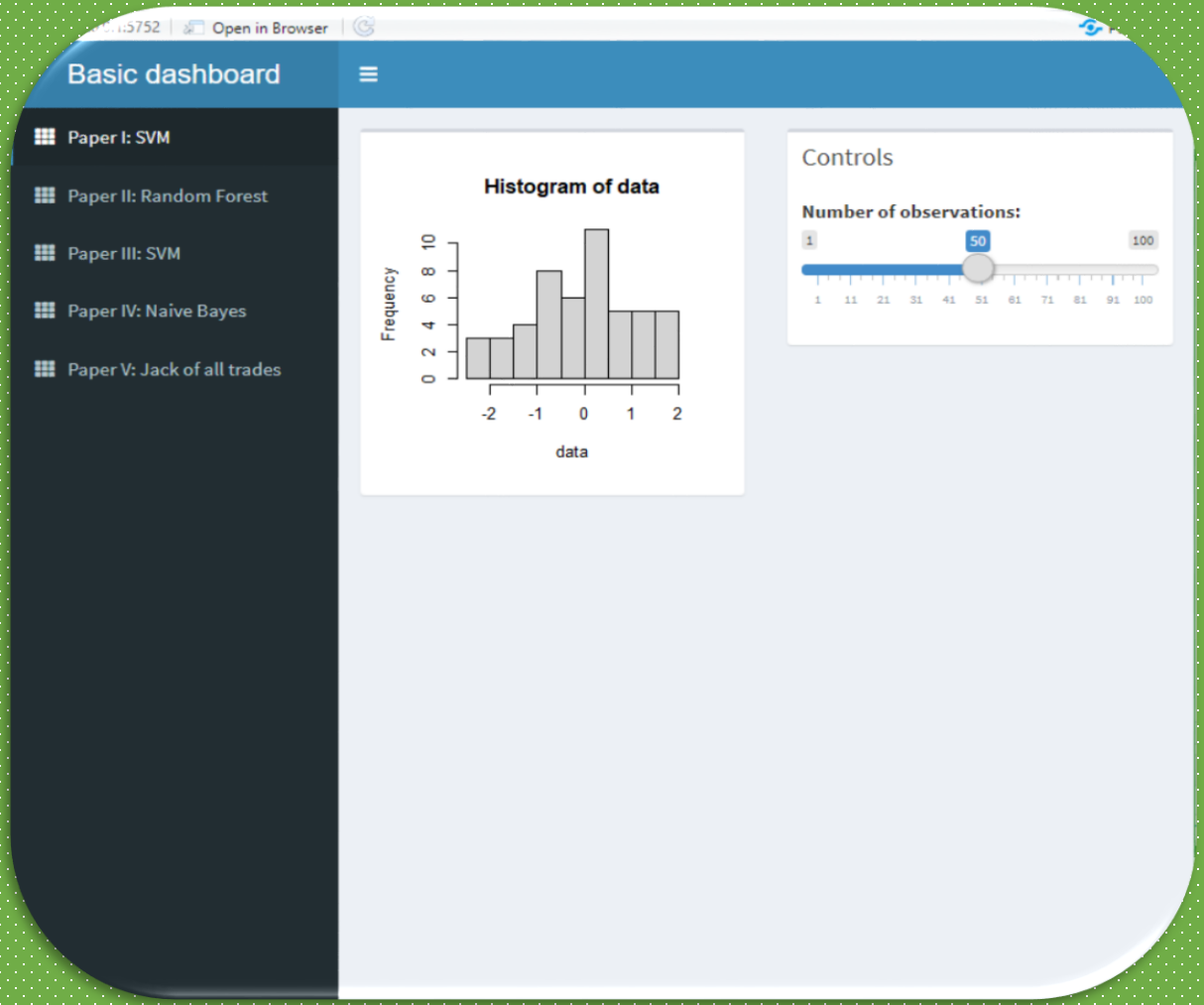
Method	TP	FP	TN	FN	Accuracy	Sensitivity	Specificity	F-Score
RF	14	3	30	3	88	82.35	90.90	85
NB	0	0	10	2	83.33	0	100	0
SVM	8	0	4	0	100	100	100	100
Spec	5	0	7	0	100	100	100	100

ارائه



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مراجع

- http://ce.sharif.edu/courses/97-98/2/ce550-1/
- maktabkhooneh.org
- Foundations and Applications of Statistics An Introduction Using R [1,2,3]
- R for data science

با سپاس از توجه شما