

Homework

Priyanka Emani - 1001981861

Aravind Kashyap - 1001956591

Shreyas Jagadeep - 1001888859



UNIVERSITY OF
TEXAS
ARLINGTON

CSE: 5370 Bioinformatics

April 20, 2022

1. RNA Seq Analysis

Please download a publicly available RNA-Seq dataset that has two conditions (experimental versus control; drug treatment vs placebo, etc.). Computationally process it and analyze it; in a LATEX document report what the differential expressed genes are between the two conditions, their log fold change, and their p-value. Include all of your code. Examples that have had this analysis conducted in papers or online tutorials will not be given credit..

Solution

```
1 {
2   "nbformat": 4,
3   "nbformat_minor": 0,
4   "metadata": {
5     "colab": {
6       "name": "RNASeq.ipynb",
7       "provenance": [],
8       "collapsed_sections": []
9     },
10    "kernel_spec": {
11      "name": "python3",
12      "display_name": "Python 3"
13    },
14    "language_info": {
15      "name": "python"
16    }
17  },
18  "cells": [
19    {
20      "cell_type": "code",
21      "execution_count": 1,
22      "metadata": {
23        "colab": {
24          "base_uri": "https://localhost:8080/"
25        },
26        "id": "pXvD8_hJi9kA",
27        "outputId": "3515ec94-6f88-4729-d9e1-49071ca44d8e"
28      },
29      "outputs": [
30        {
31          "output_type": "stream",
32          "name": "stdout",
33          "text": [
34            "/usr/local/bin/python\n",
35            "Python 3.7.13\n",
36            "/env/python\n",
37            "env: PYTHONPATH=\n"
38          ]
39        }
40      ],
41      "source": [
42        "!which python # should return /usr/local/bin/python\n",
43        "!python --version\n",
44        "!echo $PYTHONPATH\n",
45        "%env PYTHONPATH="
46      ]
47    },
48    {
49      "cell_type": "code",
```

```

50     "source": [
51         "%bash\n",
52         "MINICONDA_INSTALLER_SCRIPT=Miniconda3-4.5.4-Linux-x86_64.sh\n",
53         "MINICONDA_PREFIX=/usr/local\n",
54         "wget https://repo.continuum.io/miniconda/$MINICONDA_INSTALLER_SCRIPT\n",
55         "chmod +x $MINICONDA_INSTALLER_SCRIPT\n",
56         ".$MINICONDA_INSTALLER_SCRIPT -b -f -p $MINICONDA_PREFIX"
57     ],
58     "metadata": {
59         "colab": {
60             "base_uri": "https://localhost:8080/"
61         },
62         "id": "XV1aGibfjDZa",
63         "outputId": "659129ad-4ab2-463c-e00f-a5568dce6db1"
64     },
65     "execution_count": 2,
66     "outputs": [
67         {
68             "output_type": "stream",
69             "name": "stdout",
70             "text": [
71                 "PREFIX=/usr/local\n",
72                 "installing: python-3.6.5-hc3d631a_2 ...\n",
73                 "installing: ca-certificates-2018.03.07-0 ...\n",
74                 "installing: conda-env-2.6.0-h36134e3_1 ...\n",
75                 "installing: libgcc-ng-7.2.0-hdf63c60_3 ...\n",
76                 "installing: libstdcxx-ng-7.2.0-hdf63c60_3 ...\n",
77                 "installing: libffi-3.2.1-hd88cf55_4 ...\n",
78                 "installing: ncurses-6.1-hf484d3e_0 ...\n",
79                 "installing: openssl-1.0.2o-h20670df_0 ...\n",
80                 "installing: tk-8.6.7-hc745277_3 ...\n",
81                 "installing: xz-5.2.4-h14c3975_4 ...\n",
82                 "installing: yaml-0.1.7-had09818_2 ...\n",
83                 "installing: zlib-1.2.11-ha838bed_2 ...\n",
84                 "installing: libedit-3.1.20170329-h6b74fdf_2 ...\n",
85                 "installing: readline-7.0-ha6073c6_4 ...\n",
86                 "installing: sqlite-3.23.1-he433501_0 ...\n",
87                 "installing: asn1crypto-0.24.0-py36_0 ...\n",
88                 "installing: certifi-2018.4.16-py36_0 ...\n",
89                 "installing: chardet-3.0.4-py36h0f667ec_1 ...\n",
90                 "installing: idna-2.6-py36h82fb2a8_1 ...\n",
91                 "installing: pycosat-0.6.3-py36h0a5515d_0 ...\n",
92                 "installing: pycparser-2.18-py36hf9f622e_1 ...\n",
93                 "installing: pysocks-1.6.8-py36_0 ...\n",
94                 "installing: ruamel_yaml-0.15.37-py36h14c3975_2 ...\n",
95                 "installing: six-1.11.0-py36h372c433_1 ...\n",
96                 "installing: cffi-1.11.5-py36h9745a5d_0 ...\n",
97                 "installing: setuptools-39.2.0-py36_0 ...\n",
98                 "installing: cryptography-2.2.2-py36h14c3975_0 ...\n",
99                 "installing: wheel-0.31.1-py36_0 ...\n",
100                 "installing: pip-10.0.1-py36_0 ...\n",
101                 "installing: pyopenssl-18.0.0-py36_0 ...\n",
102                 "installing: urllib3-1.22-py36hbe7ace6_0 ...\n",
103                 "installing: requests-2.18.4-py36he2e5f8d_1 ...\n",
104                 "installing: conda-4.5.4-py36_0 ...\n",
105                 "installation finished.\n"
106             ]
107         },
108         {
109             "output_type": "stream",
110             "name": "stderr",
111             "text": [

```

```

112      "--2022-04-20 19:57:26-- https://repo.continuum.io/miniconda/Miniconda3
-4.5.4-Linux-x86_64.sh\n",
113      "Resolving repo.continuum.io (repo.continuum.io)... 104.18.201.79,
104.18.200.79, 2606:4700::6812:c94f, ...\n",
114      "Connecting to repo.continuum.io (repo.continuum.io)|104.18.201.79|:443...
connected.\n",
115      "HTTP request sent, awaiting response... 301 Moved Permanently\n",
116      "Location: https://repo.anaconda.com/miniconda/Miniconda3-4.5.4-Linux-
x86_64.sh [following]\n",
117      "--2022-04-20 19:57:26-- https://repo.anaconda.com/miniconda/Miniconda3
-4.5.4-Linux-x86_64.sh\n",
118      "Resolving repo.anaconda.com (repo.anaconda.com)... 104.16.130.3,
104.16.131.3, 2606:4700::6810:8303, ...\n",
119      "Connecting to repo.anaconda.com (repo.anaconda.com)|104.16.130.3|:443...
connected.\n",
120      "HTTP request sent, awaiting response... 200 OK\n",
121      "Length: 58468498 (56M) [application/x-sh]\n",
122      "Saving to: 'Miniconda3-4.5.4-Linux-x86_64.sh\n",
123      "\n",
124      "      OK ..... 0% 25.8M
2s\n",
125      "      50K ..... 0% 21.9M
2s\n",
126      "      100K ..... 0% 18.5M
3s\n",
127      "      150K ..... 0% 39.0M
2s\n",
128      "      200K ..... 0% 146M
2s\n",
129      "      250K ..... 0% 155M
2s\n",
130      "      300K ..... 0% 254M
1s\n",
131      "      350K ..... 0% 38.1M
1s\n",
132      "      400K ..... 0% 41.5M
1s\n",
133      "      450K ..... 0% 37.8M
1s\n",
134      "      500K ..... 0% 228M
1s\n",
135      "      550K ..... 1% 34.5M
1s\n",
136      "      600K ..... 1% 233M
1s\n",
137      "      650K ..... 1% 84.4M
1s\n",
138      "      700K ..... 1% 43.3M
1s\n",
139      "      750K ..... 1% 194M
1s\n",
140      "      800K ..... 1% 168M
1s\n",
141      "      850K ..... 1% 223M
1s\n",
142      "      900K ..... 1% 122M
1s\n",
143      "      950K ..... 1% 105M
1s\n",
144      "      1000K ..... 1% 222M
1s\n",
145      "      1050K ..... 1% 6.17M

```

146	1s\n",	"	1100K	.....	2%	234M
147	1s\n",	"	1150K	.....	2%	174M
148	1s\n",	"	1200K	.....	2%	284M
149	1s\n",	"	1250K	.....	2%	261M
150	1s\n",	"	1300K	.....	2%	240M
151	1s\n",	"	1350K	.....	2%	185M
152	1s\n",	"	1400K	.....	2%	267M
153	1s\n",	"	1450K	.....	2%	116M
154	1s\n",	"	1500K	.....	2%	81.7M
155	1s\n",	"	1550K	.....	2%	70.4M
156	1s\n",	"	1600K	.....	2%	186M
157	1s\n",	"	1650K	.....	2%	174M
158	1s\n",	"	1700K	.....	3%	19.4M
159	1s\n",	"	1750K	.....	3%	73.5M
160	1s\n",	"	1800K	.....	3%	22.0M
161	1s\n",	"	1850K	.....	3%	161M
162	1s\n",	"	1900K	.....	3%	10.1M
163	1s\n",	"	1950K	.....	3%	6.79M
164	1s\n",	"	2000K	.....	3%	20.3M
165	1s\n",	"	2050K	.....	3%	49.4M
166	1s\n",	"	2100K	.....	3%	225M
167	1s\n",	"	2150K	.....	3%	198M
168	1s\n",	"	2200K	.....	3%	237M
169	1s\n",	"	2250K	.....	4%	190M
170	1s\n",	"	2300K	.....	4%	195M
171	1s\n",	"	2350K	.....	4%	178M
172	1s\n",	"	2400K	.....	4%	235M
173	1s\n",	"	2450K	.....	4%	39.9M
174	1s\n",	"	2500K	.....	4%	20.9M
175	1s\n",	"	2550K	.....	4%	9.16M
176	1s\n",	"	2600K	.....	4%	19.3M

177	1s\n",	"	2650K	.....	4%	11.9M
178	1s\n",	"	2700K	.....	4%	3.67M
179	2s\n",	"	2750K	.....	4%	39.2M
180	2s\n",	"	2800K	.....	4%	177M
181	2s\n",	"	2850K	.....	5%	227M
182	2s\n",	"	2900K	.....	5%	235M
183	2s\n",	"	2950K	.....	5%	215M
184	2s\n",	"	3000K	.....	5%	214M
185	1s\n",	"	3050K	.....	5%	177M
186	1s\n",	"	3100K	.....	5%	205M
187	1s\n",	"	3150K	.....	5%	160M
188	1s\n",	"	3200K	.....	5%	12.5M
189	1s\n",	"	3250K	.....	5%	16.8M
190	1s\n",	"	3300K	.....	5%	4.78M
191	2s\n",	"	3350K	.....	5%	7.27M
192	2s\n",	"	3400K	.....	6%	37.2M
193	2s\n",	"	3450K	.....	6%	42.0M
194	2s\n",	"	3500K	.....	6%	42.8M
195	2s\n",	"	3550K	.....	6%	42.9M
196	2s\n",	"	3600K	.....	6%	74.4M
197	2s\n",	"	3650K	.....	6%	131M
198	2s\n",	"	3700K	.....	6%	68.5M
199	2s\n",	"	3750K	.....	6%	64.2M
200	2s\n",	"	3800K	.....	6%	117M
201	2s\n",	"	3850K	.....	6%	52.6M
202	2s\n",	"	3900K	.....	6%	108M
203	2s\n",	"	3950K	.....	7%	116M
204	2s\n",	"	4000K	.....	7%	41.5M
205	2s\n",	"	4050K	.....	7%	82.3M
206	2s\n",	"	4100K	.....	7%	84.5M
207	2s\n",	"	4150K	.....	7%	223M

208	2s\n",	"	4200K	.....	7%	40.7M
209	2s\n",	"	4250K	.....	7%	239M
210	1s\n",	"	4300K	.....	7%	71.4M
211	1s\n",	"	4350K	.....	7%	46.6M
212	1s\n",	"	4400K	.....	7%	60.5M
213	1s\n",	"	4450K	.....	7%	91.4M
214	1s\n",	"	4500K	.....	7%	54.6M
215	1s\n",	"	4550K	.....	8%	71.3M
216	1s\n",	"	4600K	.....	8%	71.9M
217	1s\n",	"	4650K	.....	8%	240M
218	1s\n",	"	4700K	.....	8%	94.8M
219	1s\n",	"	4750K	.....	8%	34.4M
220	1s\n",	"	4800K	.....	8%	66.8M
221	1s\n",	"	4850K	.....	8%	134M
222	1s\n",	"	4900K	.....	8%	241M
223	1s\n",	"	4950K	.....	8%	41.9M
224	1s\n",	"	5000K	.....	8%	40.7M
225	1s\n",	"	5050K	.....	8%	69.3M
226	1s\n",	"	5100K	.....	9%	227M
227	1s\n",	"	5150K	.....	9%	52.2M
228	1s\n",	"	5200K	.....	9%	56.9M
229	1s\n",	"	5250K	.....	9%	19.5M
230	1s\n",	"	5300K	.....	9%	76.0M
231	1s\n",	"	5350K	.....	9%	50.8M
232	1s\n",	"	5400K	.....	9%	87.4M
233	1s\n",	"	5450K	.....	9%	54.3M
234	1s\n",	"	5500K	.....	9%	239M
235	1s\n",	"	5550K	.....	9%	14.4M
236	1s\n",	"	5600K	.....	9%	121M
237	1s\n",	"	5650K	.....	9%	55.1M
238	1s\n",	"	5700K	.....	10%	129M

239	1s\n",	"	5750K	.....	10%	46.5M
240	1s\n",	"	5800K	.....	10%	57.7M
241	1s\n",	"	5850K	.....	10%	84.6M
242	1s\n",	"	5900K	.....	10%	99.9M
243	1s\n",	"	5950K	.....	10%	60.8M
244	1s\n",	"	6000K	.....	10%	63.8M
245	1s\n",	"	6050K	.....	10%	20.1M
246	1s\n",	"	6100K	.....	10%	79.1M
247	1s\n",	"	6150K	.....	10%	58.2M
248	1s\n",	"	6200K	.....	10%	232M
249	1s\n",	"	6250K	.....	11%	253M
250	1s\n",	"	6300K	.....	11%	123M
251	1s\n",	"	6350K	.....	11%	36.9M
252	1s\n",	"	6400K	.....	11%	73.5M
253	1s\n",	"	6450K	.....	11%	55.5M
254	1s\n",	"	6500K	.....	11%	60.2M
255	1s\n",	"	6550K	.....	11%	83.7M
256	1s\n",	"	6600K	.....	11%	197M
257	1s\n",	"	6650K	.....	11%	230M
258	1s\n",	"	6700K	.....	11%	69.8M
259	1s\n",	"	6750K	.....	11%	34.5M
260	1s\n",	"	6800K	.....	11%	36.5M
261	1s\n",	"	6850K	.....	12%	51.4M
262	1s\n",	"	6900K	.....	12%	72.7M
263	1s\n",	"	6950K	.....	12%	70.0M
264	1s\n",	"	7000K	.....	12%	210M
265	1s\n",	"	7050K	.....	12%	39.3M
266	1s\n",	"	7100K	.....	12%	69.0M
267	1s\n",	"	7150K	.....	12%	60.9M
268	1s\n",	"	7200K	.....	12%	91.9M
269	1s\n",	"	7250K	.....	12%	41.3M

270	1s\n",	"	7300K	.....	12%	117M
271	1s\n",	"	7350K	.....	12%	199M
272	1s\n",	"	7400K	.....	13%	103M
273	1s\n",	"	7450K	.....	13%	37.5M
274	1s\n",	"	7500K	.....	13%	43.9M
275	1s\n",	"	7550K	.....	13%	75.8M
276	1s\n",	"	7600K	.....	13%	242M
277	1s\n",	"	7650K	.....	13%	36.7M
278	1s\n",	"	7700K	.....	13%	98.6M
279	1s\n",	"	7750K	.....	13%	40.3M
280	1s\n",	"	7800K	.....	13%	189M
281	1s\n",	"	7850K	.....	13%	121M
282	1s\n",	"	7900K	.....	13%	38.3M
283	1s\n",	"	7950K	.....	14%	61.7M
284	1s\n",	"	8000K	.....	14%	92.6M
285	1s\n",	"	8050K	.....	14%	114M
286	1s\n",	"	8100K	.....	14%	40.7M
287	1s\n",	"	8150K	.....	14%	50.7M
288	1s\n",	"	8200K	.....	14%	155M
289	1s\n",	"	8250K	.....	14%	233M
290	1s\n",	"	8300K	.....	14%	49.9M
291	1s\n",	"	8350K	.....	14%	9.97M
292	1s\n",	"	8400K	.....	14%	54.3M
293	1s\n",	"	8450K	.....	14%	73.5M
294	1s\n",	"	8500K	.....	14%	94.4M
295	1s\n",	"	8550K	.....	15%	48.0M
296	1s\n",	"	8600K	.....	15%	175M
297	1s\n",	"	8650K	.....	15%	216M
298	1s\n",	"	8700K	.....	15%	190M
299	1s\n",	"	8750K	.....	15%	193M
300	1s\n",	"	8800K	.....	15%	58.5M

301	1s\n",	"	8850K	.....	15%	6.66M
302	1s\n",	"	8900K	.....	15%	38.2M
303	1s\n",	"	8950K	.....	15%	38.6M
304	1s\n",	"	9000K	.....	15%	40.6M
305	1s\n",	"	9050K	.....	15%	41.3M
306	1s\n",	"	9100K	.....	16%	72.7M
307	1s\n",	"	9150K	.....	16%	73.2M
308	1s\n",	"	9200K	.....	16%	46.4M
309	1s\n",	"	9250K	.....	16%	121M
310	1s\n",	"	9300K	.....	16%	65.8M
311	1s\n",	"	9350K	.....	16%	49.1M
312	1s\n",	"	9400K	.....	16%	89.3M
313	1s\n",	"	9450K	.....	16%	40.4M
314	1s\n",	"	9500K	.....	16%	217M
315	1s\n",	"	9550K	.....	16%	42.1M
316	1s\n",	"	9600K	.....	16%	49.4M
317	1s\n",	"	9650K	.....	16%	82.6M
318	1s\n",	"	9700K	.....	17%	124M
319	1s\n",	"	9750K	.....	17%	69.8M
320	1s\n",	"	9800K	.....	17%	262M
321	1s\n",	"	9850K	.....	17%	261M
322	1s\n",	"	9900K	.....	17%	260M
323	1s\n",	"	9950K	.....	17%	46.9M
324	1s\n",	"	10000K	.....	17%	54.4M
325	1s\n",	"	10050K	.....	17%	67.4M
326	1s\n",	"	10100K	.....	17%	36.6M
327	1s\n",	"	10150K	.....	17%	112M
328	1s\n",	"	10200K	.....	17%	289M
329	1s\n",	"	10250K	.....	18%	266M
330	1s\n",	"	10300K	.....	18%	242M
331	1s\n",	"	10350K	.....	18%	183M

332	1s\n",	" 10400K	.....	18%	246M
333	1s\n",	" 10450K	.....	18%	263M
334	1s\n",	" 10500K	.....	18%	261M
335	1s\n",	" 10550K	.....	18%	230M
336	1s\n",	" 10600K	.....	18%	233M
337	1s\n",	" 10650K	.....	18%	222M
338	1s\n",	" 10700K	.....	18%	264M
339	1s\n",	" 10750K	.....	18%	215M
340	1s\n",	" 10800K	.....	19%	239M
341	1s\n",	" 10850K	.....	19%	222M
342	1s\n",	" 10900K	.....	19%	237M
343	1s\n",	" 10950K	.....	19%	240M
344	1s\n",	" 11000K	.....	19%	230M
345	1s\n",	" 11050K	.....	19%	256M
346	1s\n",	" 11100K	.....	19%	220M
347	1s\n",	" 11150K	.....	19%	213M
348	1s\n",	" 11200K	.....	19%	257M
349	1s\n",	" 11250K	.....	19%	238M
350	1s\n",	" 11300K	.....	19%	58.6M
351	1s\n",	" 11350K	.....	19%	41.2M
352	1s\n",	" 11400K	.....	20%	48.5M
353	1s\n",	" 11450K	.....	20%	44.8M
354	1s\n",	" 11500K	.....	20%	39.5M
355	1s\n",	" 11550K	.....	20%	36.5M
356	1s\n",	" 11600K	.....	20%	41.0M
357	1s\n",	" 11650K	.....	20%	44.7M
358	1s\n",	" 11700K	.....	20%	45.9M
359	1s\n",	" 11750K	.....	20%	37.5M
360	1s\n",	" 11800K	.....	20%	43.8M
361	1s\n",	" 11850K	.....	20%	44.2M
362	1s\n",	" 11900K	.....	20%	42.8M

363	1s\n",	" 11950K	.....	21%	73.4M
364	1s\n",	" 12000K	.....	21%	238M
365	1s\n",	" 12050K	.....	21%	245M
366	1s\n",	" 12100K	.....	21%	232M
367	1s\n",	" 12150K	.....	21%	66.6M
368	1s\n",	" 12200K	.....	21%	42.7M
369	1s\n",	" 12250K	.....	21%	45.4M
370	1s\n",	" 12300K	.....	21%	140M
371	1s\n",	" 12350K	.....	21%	207M
372	1s\n",	" 12400K	.....	21%	250M
373	1s\n",	" 12450K	.....	21%	196M
374	1s\n",	" 12500K	.....	21%	16.0M
375	1s\n",	" 12550K	.....	22%	5.00M
376	1s\n",	" 12600K	.....	22%	5.72M
377	1s\n",	" 12650K	.....	22%	22.0M
378	1s\n",	" 12700K	.....	22%	28.5M
379	1s\n",	" 12750K	.....	22%	42.1M
380	1s\n",	" 12800K	.....	22%	240M
381	1s\n",	" 12850K	.....	22%	21.2M
382	1s\n",	" 12900K	.....	22%	24.8M
383	1s\n",	" 12950K	.....	22%	29.5M
384	1s\n",	" 13000K	.....	22%	59.8M
385	1s\n",	" 13050K	.....	22%	209M
386	1s\n",	" 13100K	.....	23%	142M
387	1s\n",	" 13150K	.....	23%	19.6M
388	1s\n",	" 13200K	.....	23%	229M
389	1s\n",	" 13250K	.....	23%	202M
390	1s\n",	" 13300K	.....	23%	229M
391	1s\n",	" 13350K	.....	23%	204M
392	1s\n",	" 13400K	.....	23%	227M
393	1s\n",	" 13450K	.....	23%	238M

394	1s\n",	" 13500K	.....	23%	223M
395	1s\n",	" 13550K	.....	23%	187M
396	1s\n",	" 13600K	.....	23%	189M
397	1s\n",	" 13650K	.....	23%	237M
398	1s\n",	" 13700K	.....	24%	198M
399	1s\n",	" 13750K	.....	24%	180M
400	1s\n",	" 13800K	.....	24%	205M
401	1s\n",	" 13850K	.....	24%	243M
402	1s\n",	" 13900K	.....	24%	206M
403	1s\n",	" 13950K	.....	24%	6.56M
404	1s\n",	" 14000K	.....	24%	210M
405	1s\n",	" 14050K	.....	24%	228M
406	1s\n",	" 14100K	.....	24%	215M
407	1s\n",	" 14150K	.....	24%	40.5M
408	1s\n",	" 14200K	.....	24%	219M
409	1s\n",	" 14250K	.....	25%	216M
410	1s\n",	" 14300K	.....	25%	132M
411	1s\n",	" 14350K	.....	25%	11.2M
412	1s\n",	" 14400K	.....	25%	201M
413	1s\n",	" 14450K	.....	25%	225M
414	1s\n",	" 14500K	.....	25%	231M
415	1s\n",	" 14550K	.....	25%	194M
416	1s\n",	" 14600K	.....	25%	236M
417	1s\n",	" 14650K	.....	25%	227M
418	1s\n",	" 14700K	.....	25%	198M
419	1s\n",	" 14750K	.....	25%	191M
420	1s\n",	" 14800K	.....	26%	9.92M
421	1s\n",	" 14850K	.....	26%	231M
422	1s\n",	" 14900K	.....	26%	223M
423	1s\n",	" 14950K	.....	26%	209M
424	1s\n",	" 15000K	.....	26%	230M

425	1s\n",	" 15050K	.....	26%	212M
426	1s\n",	" 15100K	.....	26%	4.58M
427	1s\n",	" 15150K	.....	26%	20.4M
428	1s\n",	" 15200K	.....	26%	238M
429	1s\n",	" 15250K	.....	26%	256M
430	1s\n",	" 15300K	.....	26%	217M
431	1s\n",	" 15350K	.....	26%	37.4M
432	1s\n",	" 15400K	.....	27%	179M
433	1s\n",	" 15450K	.....	27%	241M
434	1s\n",	" 15500K	.....	27%	218M
435	1s\n",	" 15550K	.....	27%	35.9M
436	1s\n",	" 15600K	.....	27%	192M
437	1s\n",	" 15650K	.....	27%	213M
438	1s\n",	" 15700K	.....	27%	200M
439	1s\n",	" 15750K	.....	27%	34.3M
440	1s\n",	" 15800K	.....	27%	216M
441	1s\n",	" 15850K	.....	27%	195M
442	1s\n",	" 15900K	.....	27%	215M
443	1s\n",	" 15950K	.....	28%	162M
444	1s\n",	" 16000K	.....	28%	208M
445	1s\n",	" 16050K	.....	28%	197M
446	1s\n",	" 16100K	.....	28%	21.1M
447	1s\n",	" 16150K	.....	28%	197M
448	1s\n",	" 16200K	.....	28%	190M
449	1s\n",	" 16250K	.....	28%	221M
450	1s\n",	" 16300K	.....	28%	37.5M
451	1s\n",	" 16350K	.....	28%	165M
452	1s\n",	" 16400K	.....	28%	213M
453	1s\n",	" 16450K	.....	28%	197M
454	1s\n",	" 16500K	.....	28%	37.2M
455	1s\n",	" 16550K	.....	29%	203M

456	1s\n",	" 16600K	29%	210M
457	1s\n",	" 16650K	29%	189M
458	1s\n",	" 16700K	29%	191M
459	1s\n",	" 16750K	29%	173M
460	1s\n",	" 16800K	29%	231M
461	1s\n",	" 16850K	29%	214M
462	1s\n",	" 16900K	29%	20.9M
463	1s\n",	" 16950K	29%	164M
464	1s\n",	" 17000K	29%	209M
465	1s\n",	" 17050K	29%	37.7M
466	1s\n",	" 17100K	30%	228M
467	1s\n",	" 17150K	30%	178M
468	1s\n",	" 17200K	30%	202M
469	1s\n",	" 17250K	30%	38.6M
470	1s\n",	" 17300K	30%	231M
471	1s\n",	" 17350K	30%	211M
472	1s\n",	" 17400K	30%	186M
473	1s\n",	" 17450K	30%	201M
474	1s\n",	" 17500K	30%	16.1M
475	1s\n",	" 17550K	30%	189M
476	1s\n",	" 17600K	30%	238M
477	1s\n",	" 17650K	30%	229M
478	1s\n",	" 17700K	31%	152M
479	1s\n",	" 17750K	31%	164M
480	1s\n",	" 17800K	31%	245M
481	1s\n",	" 17850K	31%	223M
482	1s\n",	" 17900K	31%	220M
483	1s\n",	" 17950K	31%	203M
484	1s\n",	" 18000K	31%	246M
485	1s\n",	" 18050K	31%	250M
486	1s\n",	" 18100K	31%	241M

487	1s\n",	" 18150K	.....	31%	22.8M
488	1s\n",	" 18200K	.....	31%	162M
489	1s\n",	" 18250K	.....	32%	231M
490	1s\n",	" 18300K	.....	32%	246M
491	1s\n",	" 18350K	.....	32%	33.5M
492	1s\n",	" 18400K	.....	32%	221M
493	1s\n",	" 18450K	.....	32%	220M
494	1s\n",	" 18500K	.....	32%	219M
495	1s\n",	" 18550K	.....	32%	195M
496	1s\n",	" 18600K	.....	32%	225M
497	1s\n",	" 18650K	.....	32%	225M
498	1s\n",	" 18700K	.....	32%	246M
499	1s\n",	" 18750K	.....	32%	20.5M
500	1s\n",	" 18800K	.....	33%	201M
501	1s\n",	" 18850K	.....	33%	220M
502	1s\n",	" 18900K	.....	33%	180M
503	1s\n",	" 18950K	.....	33%	4.68M
504	1s\n",	" 19000K	.....	33%	207M
505	1s\n",	" 19050K	.....	33%	236M
506	1s\n",	" 19100K	.....	33%	239M
507	1s\n",	" 19150K	.....	33%	192M
508	1s\n",	" 19200K	.....	33%	226M
509	1s\n",	" 19250K	.....	33%	243M
510	1s\n",	" 19300K	.....	33%	235M
511	1s\n",	" 19350K	.....	33%	219M
512	1s\n",	" 19400K	.....	34%	226M
513	1s\n",	" 19450K	.....	34%	213M
514	1s\n",	" 19500K	.....	34%	197M
515	1s\n",	" 19550K	.....	34%	183M
516	1s\n",	" 19600K	.....	34%	197M
517	1s\n",	" 19650K	.....	34%	237M

518	1s\n",	" 19700K	.....	34%	200M
519	1s\n",	" 19750K	.....	34%	194M
520	1s\n",	" 19800K	.....	34%	186M
521	1s\n",	" 19850K	.....	34%	223M
522	1s\n",	" 19900K	.....	34%	186M
523	1s\n",	" 19950K	.....	35%	6.81M
524	1s\n",	" 20000K	.....	35%	172M
525	1s\n",	" 20050K	.....	35%	226M
526	1s\n",	" 20100K	.....	35%	236M
527	1s\n",	" 20150K	.....	35%	192M
528	1s\n",	" 20200K	.....	35%	227M
529	1s\n",	" 20250K	.....	35%	235M
530	1s\n",	" 20300K	.....	35%	214M
531	1s\n",	" 20350K	.....	35%	173M
532	1s\n",	" 20400K	.....	35%	193M
533	1s\n",	" 20450K	.....	35%	221M
534	1s\n",	" 20500K	.....	35%	180M
535	1s\n",	" 20550K	.....	36%	148M
536	1s\n",	" 20600K	.....	36%	193M
537	1s\n",	" 20650K	.....	36%	235M
538	1s\n",	" 20700K	.....	36%	204M
539	1s\n",	" 20750K	.....	36%	168M
540	1s\n",	" 20800K	.....	36%	15.4M
541	1s\n",	" 20850K	.....	36%	160M
542	1s\n",	" 20900K	.....	36%	245M
543	1s\n",	" 20950K	.....	36%	186M
544	1s\n",	" 21000K	.....	36%	5.71M
545	1s\n",	" 21050K	.....	36%	139M
546	1s\n",	" 21100K	.....	37%	199M
547	1s\n",	" 21150K	.....	37%	163M
548	1s\n",	" 21200K	.....	37%	221M

549	1s\n",	" 21250K	.....	37%	213M
550	1s\n",	" 21300K	.....	37%	202M
551	1s\n",	" 21350K	.....	37%	169M
552	1s\n",	" 21400K	.....	37%	217M
553	1s\n",	" 21450K	.....	37%	220M
554	1s\n",	" 21500K	.....	37%	183M
555	1s\n",	" 21550K	.....	37%	15.3M
556	1s\n",	" 21600K	.....	37%	207M
557	1s\n",	" 21650K	.....	38%	215M
558	1s\n",	" 21700K	.....	38%	208M
559	1s\n",	" 21750K	.....	38%	210M
560	1s\n",	" 21800K	.....	38%	223M
561	1s\n",	" 21850K	.....	38%	214M
562	1s\n",	" 21900K	.....	38%	199M
563	1s\n",	" 21950K	.....	38%	13.7M
564	1s\n",	" 22000K	.....	38%	185M
565	1s\n",	" 22050K	.....	38%	199M
566	1s\n",	" 22100K	.....	38%	222M
567	1s\n",	" 22150K	.....	38%	210M
568	1s\n",	" 22200K	.....	38%	221M
569	1s\n",	" 22250K	.....	39%	196M
570	1s\n",	" 22300K	.....	39%	220M
571	1s\n",	" 22350K	.....	39%	144M
572	1s\n",	" 22400K	.....	39%	161M
573	1s\n",	" 22450K	.....	39%	195M
574	1s\n",	" 22500K	.....	39%	180M
575	1s\n",	" 22550K	.....	39%	186M
576	1s\n",	" 22600K	.....	39%	224M
577	1s\n",	" 22650K	.....	39%	190M
578	1s\n",	" 22700K	.....	39%	234M
579	1s\n",	" 22750K	.....	39%	158M

580	1s\n",	" 22800K	.....	40%	245M
581	1s\n",	" 22850K	.....	40%	225M
582	1s\n",	" 22900K	.....	40%	6.61M
583	1s\n",	" 22950K	.....	40%	191M
584	1s\n",	" 23000K	.....	40%	235M
585	1s\n",	" 23050K	.....	40%	225M
586	1s\n",	" 23100K	.....	40%	231M
587	1s\n",	" 23150K	.....	40%	194M
588	1s\n",	" 23200K	.....	40%	200M
589	1s\n",	" 23250K	.....	40%	200M
590	1s\n",	" 23300K	.....	40%	237M
591	1s\n",	" 23350K	.....	40%	220M
592	1s\n",	" 23400K	.....	41%	228M
593	1s\n",	" 23450K	.....	41%	244M
594	1s\n",	" 23500K	.....	41%	199M
595	1s\n",	" 23550K	.....	41%	167M
596	1s\n",	" 23600K	.....	41%	232M
597	1s\n",	" 23650K	.....	41%	230M
598	1s\n",	" 23700K	.....	41%	221M
599	1s\n",	" 23750K	.....	41%	192M
600	1s\n",	" 23800K	.....	41%	230M
601	1s\n",	" 23850K	.....	41%	232M
602	1s\n",	" 23900K	.....	41%	208M
603	1s\n",	" 23950K	.....	42%	197M
604	1s\n",	" 24000K	.....	42%	234M
605	1s\n",	" 24050K	.....	42%	178M
606	1s\n",	" 24100K	.....	42%	194M
607	1s\n",	" 24150K	.....	42%	195M
608	1s\n",	" 24200K	.....	42%	218M
609	1s\n",	" 24250K	.....	42%	222M
610	1s\n",	" 24300K	.....	42%	218M

611	1s\n",	" 24350K	.....	42%	195M
612	1s\n",	" 24400K	.....	42%	7.65M
613	1s\n",	" 24450K	.....	42%	216M
614	1s\n",	" 24500K	.....	42%	220M
615	1s\n",	" 24550K	.....	43%	218M
616	1s\n",	" 24600K	.....	43%	229M
617	1s\n",	" 24650K	.....	43%	250M
618	1s\n",	" 24700K	.....	43%	250M
619	1s\n",	" 24750K	.....	43%	197M
620	1s\n",	" 24800K	.....	43%	235M
621	1s\n",	" 24850K	.....	43%	248M
622	1s\n",	" 24900K	.....	43%	250M
623	1s\n",	" 24950K	.....	43%	220M
624	1s\n",	" 25000K	.....	43%	193M
625	1s\n",	" 25050K	.....	43%	204M
626	1s\n",	" 25100K	.....	44%	218M
627	1s\n",	" 25150K	.....	44%	210M
628	1s\n",	" 25200K	.....	44%	202M
629	1s\n",	" 25250K	.....	44%	212M
630	1s\n",	" 25300K	.....	44%	244M
631	1s\n",	" 25350K	.....	44%	220M
632	1s\n",	" 25400K	.....	44%	240M
633	1s\n",	" 25450K	.....	44%	246M
634	1s\n",	" 25500K	.....	44%	233M
635	1s\n",	" 25550K	.....	44%	199M
636	1s\n",	" 25600K	.....	44%	248M
637	1s\n",	" 25650K	.....	45%	240M
638	1s\n",	" 25700K	.....	45%	214M
639	1s\n",	" 25750K	.....	45%	193M
640	1s\n",	" 25800K	.....	45%	218M
641	1s\n",	" 25850K	.....	45%	234M

642	1s\n",	" 25900K	.....	45%	222M
643	1s\n",	" 25950K	.....	45%	3.39M
644	1s\n",	" 26000K	.....	45%	213M
645	1s\n",	" 26050K	.....	45%	215M
646	1s\n",	" 26100K	.....	45%	228M
647	1s\n",	" 26150K	.....	45%	161M
648	1s\n",	" 26200K	.....	45%	235M
649	1s\n",	" 26250K	.....	46%	248M
650	1s\n",	" 26300K	.....	46%	200M
651	1s\n",	" 26350K	.....	46%	150M
652	1s\n",	" 26400K	.....	46%	230M
653	1s\n",	" 26450K	.....	46%	178M
654	1s\n",	" 26500K	.....	46%	193M
655	1s\n",	" 26550K	.....	46%	164M
656	1s\n",	" 26600K	.....	46%	214M
657	1s\n",	" 26650K	.....	46%	179M
658	1s\n",	" 26700K	.....	46%	192M
659	1s\n",	" 26750K	.....	46%	170M
660	1s\n",	" 26800K	.....	47%	189M
661	1s\n",	" 26850K	.....	47%	186M
662	1s\n",	" 26900K	.....	47%	7.48M
663	1s\n",	" 26950K	.....	47%	167M
664	1s\n",	" 27000K	.....	47%	224M
665	1s\n",	" 27050K	.....	47%	234M
666	1s\n",	" 27100K	.....	47%	200M
667	1s\n",	" 27150K	.....	47%	185M
668	1s\n",	" 27200K	.....	47%	207M
669	1s\n",	" 27250K	.....	47%	202M
670	1s\n",	" 27300K	.....	47%	201M
671	1s\n",	" 27350K	.....	47%	181M
672	1s\n",	" 27400K	.....	48%	192M

673	1s\n",	" 27450K	48%	202M
674	1s\n",	" 27500K	48%	200M
675	1s\n",	" 27550K	48%	182M
676	1s\n",	" 27600K	48%	229M
677	1s\n",	" 27650K	48%	175M
678	0s\n",	" 27700K	48%	180M
679	0s\n",	" 27750K	48%	214M
680	0s\n",	" 27800K	48%	209M
681	0s\n",	" 27850K	48%	181M
682	0s\n",	" 27900K	48%	191M
683	0s\n",	" 27950K	49%	153M
684	0s\n",	" 28000K	49%	209M
685	0s\n",	" 28050K	49%	216M
686	0s\n",	" 28100K	49%	207M
687	0s\n",	" 28150K	49%	183M
688	0s\n",	" 28200K	49%	205M
689	0s\n",	" 28250K	49%	9.00M
690	0s\n",	" 28300K	49%	192M
691	0s\n",	" 28350K	49%	167M
692	0s\n",	" 28400K	49%	234M
693	0s\n",	" 28450K	49%	239M
694	0s\n",	" 28500K	50%	224M
695	0s\n",	" 28550K	50%	173M
696	0s\n",	" 28600K	50%	225M
697	0s\n",	" 28650K	50%	232M
698	0s\n",	" 28700K	50%	194M
699	0s\n",	" 28750K	50%	147M
700	0s\n",	" 28800K	50%	199M
701	0s\n",	" 28850K	50%	182M
702	0s\n",	" 28900K	50%	211M
703	0s\n",	" 28950K	50%	160M

704	0s\n",	" 29000K	.....	50%	209M
705	0s\n",	" 29050K	.....	50%	213M
706	0s\n",	" 29100K	.....	51%	221M
707	0s\n",	" 29150K	.....	51%	189M
708	0s\n",	" 29200K	.....	51%	249M
709	0s\n",	" 29250K	.....	51%	241M
710	0s\n",	" 29300K	.....	51%	234M
711	0s\n",	" 29350K	.....	51%	193M
712	0s\n",	" 29400K	.....	51%	206M
713	0s\n",	" 29450K	.....	51%	229M
714	0s\n",	" 29500K	.....	51%	256M
715	0s\n",	" 29550K	.....	51%	179M
716	0s\n",	" 29600K	.....	51%	206M
717	0s\n",	" 29650K	.....	52%	249M
718	0s\n",	" 29700K	.....	52%	6.60M
719	0s\n",	" 29750K	.....	52%	215M
720	0s\n",	" 29800K	.....	52%	233M
721	0s\n",	" 29850K	.....	52%	207M
722	0s\n",	" 29900K	.....	52%	233M
723	0s\n",	" 29950K	.....	52%	191M
724	0s\n",	" 30000K	.....	52%	224M
725	0s\n",	" 30050K	.....	52%	226M
726	0s\n",	" 30100K	.....	52%	18.6M
727	0s\n",	" 30150K	.....	52%	158M
728	0s\n",	" 30200K	.....	52%	201M
729	0s\n",	" 30250K	.....	53%	249M
730	0s\n",	" 30300K	.....	53%	217M
731	0s\n",	" 30350K	.....	53%	177M
732	0s\n",	" 30400K	.....	53%	194M
733	0s\n",	" 30450K	.....	53%	210M
734	0s\n",	" 30500K	.....	53%	244M

735	0s\n",	" 30550K	.....	53%	206M
736	0s\n",	" 30600K	.....	53%	226M
737	0s\n",	" 30650K	.....	53%	6.62M
738	0s\n",	" 30700K	.....	53%	183M
739	0s\n",	" 30750K	.....	53%	180M
740	0s\n",	" 30800K	.....	54%	212M
741	0s\n",	" 30850K	.....	54%	207M
742	0s\n",	" 30900K	.....	54%	206M
743	0s\n",	" 30950K	.....	54%	206M
744	0s\n",	" 31000K	.....	54%	242M
745	0s\n",	" 31050K	.....	54%	167M
746	0s\n",	" 31100K	.....	54%	197M
747	0s\n",	" 31150K	.....	54%	150M
748	0s\n",	" 31200K	.....	54%	209M
749	0s\n",	" 31250K	.....	54%	215M
750	0s\n",	" 31300K	.....	54%	200M
751	0s\n",	" 31350K	.....	54%	174M
752	0s\n",	" 31400K	.....	55%	212M
753	0s\n",	" 31450K	.....	55%	180M
754	0s\n",	" 31500K	.....	55%	244M
755	0s\n",	" 31550K	.....	55%	162M
756	0s\n",	" 31600K	.....	55%	173M
757	0s\n",	" 31650K	.....	55%	233M
758	0s\n",	" 31700K	.....	55%	216M
759	0s\n",	" 31750K	.....	55%	184M
760	0s\n",	" 31800K	.....	55%	198M
761	0s\n",	" 31850K	.....	55%	225M
762	0s\n",	" 31900K	.....	55%	233M
763	0s\n",	" 31950K	.....	56%	160M
764	0s\n",	" 32000K	.....	56%	6.61M
765	0s\n",	" 32050K	.....	56%	197M

766	0s\n",	" 32100K	56%	238M
767	0s\n",	" 32150K	56%	186M
768	0s\n",	" 32200K	56%	230M
769	0s\n",	" 32250K	56%	241M
770	0s\n",	" 32300K	56%	222M
771	0s\n",	" 32350K	56%	175M
772	0s\n",	" 32400K	56%	220M
773	0s\n",	" 32450K	56%	231M
774	0s\n",	" 32500K	57%	201M
775	0s\n",	" 32550K	57%	187M
776	0s\n",	" 32600K	57%	229M
777	0s\n",	" 32650K	57%	203M
778	0s\n",	" 32700K	57%	243M
779	0s\n",	" 32750K	57%	188M
780	0s\n",	" 32800K	57%	230M
781	0s\n",	" 32850K	57%	199M
782	0s\n",	" 32900K	57%	231M
783	0s\n",	" 32950K	57%	201M
784	0s\n",	" 33000K	57%	222M
785	0s\n",	" 33050K	57%	216M
786	0s\n",	" 33100K	58%	208M
787	0s\n",	" 33150K	58%	173M
788	0s\n",	" 33200K	58%	214M
789	0s\n",	" 33250K	58%	227M
790	0s\n",	" 33300K	58%	212M
791	0s\n",	" 33350K	58%	184M
792	0s\n",	" 33400K	58%	170M
793	0s\n",	" 33450K	58%	230M
794	0s\n",	" 33500K	58%	239M
795	0s\n",	" 33550K	58%	188M
796	0s\n",	" 33600K	58%	215M

797	0s\n",	" 33650K	59%	200M
798	0s\n",	" 33700K	59%	195M
799	0s\n",	" 33750K	59%	202M
800	0s\n",	" 33800K	59%	231M
801	0s\n",	" 33850K	59%	201M
802	0s\n",	" 33900K	59%	186M
803	0s\n",	" 33950K	59%	170M
804	0s\n",	" 34000K	59%	189M
805	0s\n",	" 34050K	59%	222M
806	0s\n",	" 34100K	59%	220M
807	0s\n",	" 34150K	59%	202M
808	0s\n",	" 34200K	59%	181M
809	0s\n",	" 34250K	60%	199M
810	0s\n",	" 34300K	60%	3.37M
811	0s\n",	" 34350K	60%	192M
812	0s\n",	" 34400K	60%	217M
813	0s\n",	" 34450K	60%	6.39M
814	0s\n",	" 34500K	60%	183M
815	0s\n",	" 34550K	60%	199M
816	0s\n",	" 34600K	60%	223M
817	0s\n",	" 34650K	60%	220M
818	0s\n",	" 34700K	60%	226M
819	0s\n",	" 34750K	60%	192M
820	0s\n",	" 34800K	61%	6.70M
821	0s\n",	" 34850K	61%	219M
822	0s\n",	" 34900K	61%	248M
823	0s\n",	" 34950K	61%	202M
824	0s\n",	" 35000K	61%	227M
825	0s\n",	" 35050K	61%	225M
826	0s\n",	" 35100K	61%	231M
827	0s\n",	" 35150K	61%	177M

828	0s\n",	" 35200K	.....	61%	20.4M
829	0s\n",	" 35250K	.....	61%	162M
830	0s\n",	" 35300K	.....	61%	241M
831	0s\n",	" 35350K	.....	61%	200M
832	0s\n",	" 35400K	.....	62%	207M
833	0s\n",	" 35450K	.....	62%	222M
834	0s\n",	" 35500K	.....	62%	228M
835	0s\n",	" 35550K	.....	62%	192M
836	0s\n",	" 35600K	.....	62%	237M
837	0s\n",	" 35650K	.....	62%	177M
838	0s\n",	" 35700K	.....	62%	80.3M
839	0s\n",	" 35750K	.....	62%	11.0M
840	0s\n",	" 35800K	.....	62%	211M
841	0s\n",	" 35850K	.....	62%	212M
842	0s\n",	" 35900K	.....	62%	11.2M
843	0s\n",	" 35950K	.....	63%	186M
844	0s\n",	" 36000K	.....	63%	170M
845	0s\n",	" 36050K	.....	63%	211M
846	0s\n",	" 36100K	.....	63%	156M
847	0s\n",	" 36150K	.....	63%	211M
848	0s\n",	" 36200K	.....	63%	225M
849	0s\n",	" 36250K	.....	63%	220M
850	0s\n",	" 36300K	.....	63%	197M
851	0s\n",	" 36350K	.....	63%	187M
852	0s\n",	" 36400K	.....	63%	204M
853	0s\n",	" 36450K	.....	63%	201M
854	0s\n",	" 36500K	.....	64%	166M
855	0s\n",	" 36550K	.....	64%	180M
856	0s\n",	" 36600K	.....	64%	224M
857	0s\n",	" 36650K	.....	64%	232M
858	0s\n",	" 36700K	.....	64%	221M

859	0s\n",	" 36750K	64%	190M
860	0s\n",	" 36800K	64%	211M
861	0s\n",	" 36850K	64%	213M
862	0s\n",	" 36900K	64%	14.5M
863	0s\n",	" 36950K	64%	196M
864	0s\n",	" 37000K	64%	250M
865	0s\n",	" 37050K	64%	236M
866	0s\n",	" 37100K	65%	229M
867	0s\n",	" 37150K	65%	111M
868	0s\n",	" 37200K	65%	218M
869	0s\n",	" 37250K	65%	232M
870	0s\n",	" 37300K	65%	177M
871	0s\n",	" 37350K	65%	185M
872	0s\n",	" 37400K	65%	182M
873	0s\n",	" 37450K	65%	52.0M
874	0s\n",	" 37500K	65%	204M
875	0s\n",	" 37550K	65%	151M
876	0s\n",	" 37600K	65%	199M
877	0s\n",	" 37650K	66%	199M
878	0s\n",	" 37700K	66%	198M
879	0s\n",	" 37750K	66%	161M
880	0s\n",	" 37800K	66%	190M
881	0s\n",	" 37850K	66%	200M
882	0s\n",	" 37900K	66%	8.43M
883	0s\n",	" 37950K	66%	172M
884	0s\n",	" 38000K	66%	205M
885	0s\n",	" 38050K	66%	226M
886	0s\n",	" 38100K	66%	246M
887	0s\n",	" 38150K	66%	208M
888	0s\n",	" 38200K	66%	184M
889	0s\n",	" 38250K	67%	211M

890	0s\n",	" 38300K	67%	226M
891	0s\n",	" 38350K	67%	169M
892	0s\n",	" 38400K	67%	211M
893	0s\n",	" 38450K	67%	199M
894	0s\n",	" 38500K	67%	230M
895	0s\n",	" 38550K	67%	208M
896	0s\n",	" 38600K	67%	208M
897	0s\n",	" 38650K	67%	204M
898	0s\n",	" 38700K	67%	209M
899	0s\n",	" 38750K	67%	185M
900	0s\n",	" 38800K	68%	196M
901	0s\n",	" 38850K	68%	213M
902	0s\n",	" 38900K	68%	224M
903	0s\n",	" 38950K	68%	198M
904	0s\n",	" 39000K	68%	221M
905	0s\n",	" 39050K	68%	207M
906	0s\n",	" 39100K	68%	208M
907	0s\n",	" 39150K	68%	178M
908	0s\n",	" 39200K	68%	206M
909	0s\n",	" 39250K	68%	203M
910	0s\n",	" 39300K	68%	218M
911	0s\n",	" 39350K	69%	193M
912	0s\n",	" 39400K	69%	218M
913	0s\n",	" 39450K	69%	5.72M
914	0s\n",	" 39500K	69%	36.7M
915	0s\n",	" 39550K	69%	39.2M
916	0s\n",	" 39600K	69%	35.1M
917	0s\n",	" 39650K	69%	4.79M
918	0s\n",	" 39700K	69%	31.5M
919	0s\n",	" 39750K	69%	179M
920	0s\n",	" 39800K	69%	234M

921	0s\n",	" 39850K	69%	246M
922	0s\n",	" 39900K	69%	233M
923	0s\n",	" 39950K	70%	175M
924	0s\n",	" 40000K	70%	234M
925	0s\n",	" 40050K	70%	236M
926	0s\n",	" 40100K	70%	214M
927	0s\n",	" 40150K	70%	5.43M
928	0s\n",	" 40200K	70%	38.6M
929	0s\n",	" 40250K	70%	6.31M
930	0s\n",	" 40300K	70%	45.1M
931	0s\n",	" 40350K	70%	36.1M
932	0s\n",	" 40400K	70%	7.03M
933	0s\n",	" 40450K	70%	163M
934	0s\n",	" 40500K	71%	211M
935	0s\n",	" 40550K	71%	206M
936	0s\n",	" 40600K	71%	194M
937	0s\n",	" 40650K	71%	234M
938	0s\n",	" 40700K	71%	229M
939	0s\n",	" 40750K	71%	189M
940	0s\n",	" 40800K	71%	12.1M
941	0s\n",	" 40850K	71%	9.06M
942	0s\n",	" 40900K	71%	17.3M
943	0s\n",	" 40950K	71%	12.2M
944	0s\n",	" 41000K	71%	8.15M
945	0s\n",	" 41050K	71%	58.6M
946	0s\n",	" 41100K	72%	173M
947	0s\n",	" 41150K	72%	201M
948	0s\n",	" 41200K	72%	217M
949	0s\n",	" 41250K	72%	245M
950	0s\n",	" 41300K	72%	215M
951	0s\n",	" 41350K	72%	206M

952	0s\n",	" 41400K	.....	72%	243M
953	0s\n",	" 41450K	.....	72%	235M
954	0s\n",	" 41500K	.....	72%	14.8M
955	0s\n",	" 41550K	.....	72%	4.39M
956	0s\n",	" 41600K	.....	72%	232M
957	0s\n",	" 41650K	.....	73%	207M
958	0s\n",	" 41700K	.....	73%	213M
959	0s\n",	" 41750K	.....	73%	147M
960	0s\n",	" 41800K	.....	73%	193M
961	0s\n",	" 41850K	.....	73%	197M
962	0s\n",	" 41900K	.....	73%	194M
963	0s\n",	" 41950K	.....	73%	139M
964	0s\n",	" 42000K	.....	73%	218M
965	0s\n",	" 42050K	.....	73%	219M
966	0s\n",	" 42100K	.....	73%	190M
967	0s\n",	" 42150K	.....	73%	192M
968	0s\n",	" 42200K	.....	73%	208M
969	0s\n",	" 42250K	.....	74%	237M
970	0s\n",	" 42300K	.....	74%	227M
971	0s\n",	" 42350K	.....	74%	172M
972	0s\n",	" 42400K	.....	74%	221M
973	0s\n",	" 42450K	.....	74%	231M
974	0s\n",	" 42500K	.....	74%	231M
975	0s\n",	" 42550K	.....	74%	185M
976	0s\n",	" 42600K	.....	74%	222M
977	0s\n",	" 42650K	.....	74%	239M
978	0s\n",	" 42700K	.....	74%	222M
979	0s\n",	" 42750K	.....	74%	151M
980	0s\n",	" 42800K	.....	75%	174M
981	0s\n",	" 42850K	.....	75%	197M
982	0s\n",	" 42900K	.....	75%	192M

983	0s\n",	" 42950K	75%	162M
984	0s\n",	" 43000K	75%	173M
985	0s\n",	" 43050K	75%	199M
986	0s\n",	" 43100K	75%	183M
987	0s\n",	" 43150K	75%	126M
988	0s\n",	" 43200K	75%	184M
989	0s\n",	" 43250K	75%	190M
990	0s\n",	" 43300K	75%	208M
991	0s\n",	" 43350K	76%	191M
992	0s\n",	" 43400K	76%	227M
993	0s\n",	" 43450K	76%	227M
994	0s\n",	" 43500K	76%	190M
995	0s\n",	" 43550K	76%	194M
996	0s\n",	" 43600K	76%	226M
997	0s\n",	" 43650K	76%	225M
998	0s\n",	" 43700K	76%	240M
999	0s\n",	" 43750K	76%	190M
1000	0s\n",	" 43800K	76%	231M
1001	0s\n",	" 43850K	76%	232M
1002	0s\n",	" 43900K	76%	182M
1003	0s\n",	" 43950K	77%	144M
1004	0s\n",	" 44000K	77%	168M
1005	0s\n",	" 44050K	77%	186M
1006	0s\n",	" 44100K	77%	173M
1007	0s\n",	" 44150K	77%	158M
1008	0s\n",	" 44200K	77%	174M
1009	0s\n",	" 44250K	77%	165M
1010	0s\n",	" 44300K	77%	168M
1011	0s\n",	" 44350K	77%	176M
1012	0s\n",	" 44400K	77%	217M
1013	0s\n",	" 44450K	77%	204M

1014	0s\n",	" 44500K	.....	78%	244M
1015	0s\n",	" 44550K	.....	78%	206M
1016	0s\n",	" 44600K	.....	78%	231M
1017	0s\n",	" 44650K	.....	78%	215M
1018	0s\n",	" 44700K	.....	78%	205M
1019	0s\n",	" 44750K	.....	78%	175M
1020	0s\n",	" 44800K	.....	78%	226M
1021	0s\n",	" 44850K	.....	78%	212M
1022	0s\n",	" 44900K	.....	78%	183M
1023	0s\n",	" 44950K	.....	78%	169M
1024	0s\n",	" 45000K	.....	78%	206M
1025	0s\n",	" 45050K	.....	78%	173M
1026	0s\n",	" 45100K	.....	79%	161M
1027	0s\n",	" 45150K	.....	79%	148M
1028	0s\n",	" 45200K	.....	79%	202M
1029	0s\n",	" 45250K	.....	79%	209M
1030	0s\n",	" 45300K	.....	79%	224M
1031	0s\n",	" 45350K	.....	79%	199M
1032	0s\n",	" 45400K	.....	79%	204M
1033	0s\n",	" 45450K	.....	79%	214M
1034	0s\n",	" 45500K	.....	79%	240M
1035	0s\n",	" 45550K	.....	79%	181M
1036	0s\n",	" 45600K	.....	79%	212M
1037	0s\n",	" 45650K	.....	80%	208M
1038	0s\n",	" 45700K	.....	80%	171M
1039	0s\n",	" 45750K	.....	80%	175M
1040	0s\n",	" 45800K	.....	80%	188M
1041	0s\n",	" 45850K	.....	80%	184M
1042	0s\n",	" 45900K	.....	80%	172M
1043	0s\n",	" 45950K	.....	80%	152M
1044	0s\n",	" 46000K	.....	80%	191M

1045	0s\n",	" 46050K	80%	193M
1046	0s\n",	" 46100K	80%	219M
1047	0s\n",	" 46150K	80%	205M
1048	0s\n",	" 46200K	81%	239M
1049	0s\n",	" 46250K	81%	213M
1050	0s\n",	" 46300K	81%	216M
1051	0s\n",	" 46350K	81%	198M
1052	0s\n",	" 46400K	81%	204M
1053	0s\n",	" 46450K	81%	185M
1054	0s\n",	" 46500K	81%	238M
1055	0s\n",	" 46550K	81%	207M
1056	0s\n",	" 46600K	81%	227M
1057	0s\n",	" 46650K	81%	205M
1058	0s\n",	" 46700K	81%	205M
1059	0s\n",	" 46750K	81%	168M
1060	0s\n",	" 46800K	82%	219M
1061	0s\n",	" 46850K	82%	214M
1062	0s\n",	" 46900K	82%	183M
1063	0s\n",	" 46950K	82%	163M
1064	0s\n",	" 47000K	82%	219M
1065	0s\n",	" 47050K	82%	245M
1066	0s\n",	" 47100K	82%	210M
1067	0s\n",	" 47150K	82%	167M
1068	0s\n",	" 47200K	82%	171M
1069	0s\n",	" 47250K	82%	217M
1070	0s\n",	" 47300K	82%	199M
1071	0s\n",	" 47350K	83%	176M
1072	0s\n",	" 47400K	83%	204M
1073	0s\n",	" 47450K	83%	228M
1074	0s\n",	" 47500K	83%	177M
1075	0s\n",	" 47550K	83%	149M

1076	0s\n",	" 47600K	83%	174M
1077	0s\n",	" 47650K	83%	176M
1078	0s\n",	" 47700K	83%	167M
1079	0s\n",	" 47750K	83%	164M
1080	0s\n",	" 47800K	83%	215M
1081	0s\n",	" 47850K	83%	167M
1082	0s\n",	" 47900K	83%	166M
1083	0s\n",	" 47950K	84%	180M
1084	0s\n",	" 48000K	84%	234M
1085	0s\n",	" 48050K	84%	217M
1086	0s\n",	" 48100K	84%	232M
1087	0s\n",	" 48150K	84%	201M
1088	0s\n",	" 48200K	84%	233M
1089	0s\n",	" 48250K	84%	225M
1090	0s\n",	" 48300K	84%	238M
1091	0s\n",	" 48350K	84%	164M
1092	0s\n",	" 48400K	84%	225M
1093	0s\n",	" 48450K	84%	177M
1094	0s\n",	" 48500K	85%	167M
1095	0s\n",	" 48550K	85%	158M
1096	0s\n",	" 48600K	85%	192M
1097	0s\n",	" 48650K	85%	162M
1098	0s\n",	" 48700K	85%	157M
1099	0s\n",	" 48750K	85%	151M
1100	0s\n",	" 48800K	85%	182M
1101	0s\n",	" 48850K	85%	205M
1102	0s\n",	" 48900K	85%	213M
1103	0s\n",	" 48950K	85%	202M
1104	0s\n",	" 49000K	85%	227M
1105	0s\n",	" 49050K	85%	219M
1106	0s\n",	" 49100K	86%	198M

1107	0s\n",	" 49150K	86%	140M
1108	0s\n",	" 49200K	86%	176M
1109	0s\n",	" 49250K	86%	217M
1110	0s\n",	" 49300K	86%	228M
1111	0s\n",	" 49350K	86%	194M
1112	0s\n",	" 49400K	86%	213M
1113	0s\n",	" 49450K	86%	198M
1114	0s\n",	" 49500K	86%	178M
1115	0s\n",	" 49550K	86%	175M
1116	0s\n",	" 49600K	86%	179M
1117	0s\n",	" 49650K	87%	189M
1118	0s\n",	" 49700K	87%	234M
1119	0s\n",	" 49750K	87%	213M
1120	0s\n",	" 49800K	87%	205M
1121	0s\n",	" 49850K	87%	213M
1122	0s\n",	" 49900K	87%	202M
1123	0s\n",	" 49950K	87%	168M
1124	0s\n",	" 50000K	87%	219M
1125	0s\n",	" 50050K	87%	161M
1126	0s\n",	" 50100K	87%	223M
1127	0s\n",	" 50150K	87%	178M
1128	0s\n",	" 50200K	88%	177M
1129	0s\n",	" 50250K	88%	199M
1130	0s\n",	" 50300K	88%	187M
1131	0s\n",	" 50350K	88%	152M
1132	0s\n",	" 50400K	88%	193M
1133	0s\n",	" 50450K	88%	176M
1134	0s\n",	" 50500K	88%	229M
1135	0s\n",	" 50550K	88%	214M
1136	0s\n",	" 50600K	88%	228M
1137	0s\n",	" 50650K	88%	187M

1138	0s\n",	" 50700K	88%	157M
1139	0s\n",	" 50750K	88%	189M
1140	0s\n",	" 50800K	89%	198M
1141	0s\n",	" 50850K	89%	225M
1142	0s\n",	" 50900K	89%	242M
1143	0s\n",	" 50950K	89%	208M
1144	0s\n",	" 51000K	89%	235M
1145	0s\n",	" 51050K	89%	207M
1146	0s\n",	" 51100K	89%	210M
1147	0s\n",	" 51150K	89%	192M
1148	0s\n",	" 51200K	89%	194M
1149	0s\n",	" 51250K	89%	177M
1150	0s\n",	" 51300K	89%	208M
1151	0s\n",	" 51350K	90%	189M
1152	0s\n",	" 51400K	90%	203M
1153	0s\n",	" 51450K	90%	157M
1154	0s\n",	" 51500K	90%	200M
1155	0s\n",	" 51550K	90%	164M
1156	0s\n",	" 51600K	90%	167M
1157	0s\n",	" 51650K	90%	187M
1158	0s\n",	" 51700K	90%	201M
1159	0s\n",	" 51750K	90%	217M
1160	0s\n",	" 51800K	90%	196M
1161	0s\n",	" 51850K	90%	231M
1162	0s\n",	" 51900K	90%	221M
1163	0s\n",	" 51950K	91%	198M
1164	0s\n",	" 52000K	91%	219M
1165	0s\n",	" 52050K	91%	220M
1166	0s\n",	" 52100K	91%	228M
1167	0s\n",	" 52150K	91%	224M
1168	0s\n",	" 52200K	91%	181M

1169	0s\n",	" 52250K	.....	91%	158M
1170	0s\n",	" 52300K	.....	91%	213M
1171	0s\n",	" 52350K	.....	91%	161M
1172	0s\n",	" 52400K	.....	91%	197M
1173	0s\n",	" 52450K	.....	91%	207M
1174	0s\n",	" 52500K	.....	92%	205M
1175	0s\n",	" 52550K	.....	92%	178M
1176	0s\n",	" 52600K	.....	92%	210M
1177	0s\n",	" 52650K	.....	92%	213M
1178	0s\n",	" 52700K	.....	92%	235M
1179	0s\n",	" 52750K	.....	92%	200M
1180	0s\n",	" 52800K	.....	92%	233M
1181	0s\n",	" 52850K	.....	92%	225M
1182	0s\n",	" 52900K	.....	92%	231M
1183	0s\n",	" 52950K	.....	92%	218M
1184	0s\n",	" 53000K	.....	92%	245M
1185	0s\n",	" 53050K	.....	92%	239M
1186	0s\n",	" 53100K	.....	93%	240M
1187	0s\n",	" 53150K	.....	93%	196M
1188	0s\n",	" 53200K	.....	93%	242M
1189	0s\n",	" 53250K	.....	93%	180M
1190	0s\n",	" 53300K	.....	93%	195M
1191	0s\n",	" 53350K	.....	93%	169M
1192	0s\n",	" 53400K	.....	93%	221M
1193	0s\n",	" 53450K	.....	93%	215M
1194	0s\n",	" 53500K	.....	93%	19.6M
1195	0s\n",	" 53550K	.....	93%	177M
1196	0s\n",	" 53600K	.....	93%	248M
1197	0s\n",	" 53650K	.....	94%	38.8M
1198	0s\n",	" 53700K	.....	94%	194M
1199	0s\n",	" 53750K	.....	94%	186M

1200	0s\n",	" 53800K	.....	94%	201M
1201	0s\n",	" 53850K	.....	94%	21.3M
1202	0s\n",	" 53900K	.....	94%	190M
1203	0s\n",	" 53950K	.....	94%	159M
1204	0s\n",	" 54000K	.....	94%	3.26M
1205	0s\n",	" 54050K	.....	94%	151M
1206	0s\n",	" 54100K	.....	94%	1.39M
1207	0s\n",	" 54150K	.....	94%	158M
1208	0s\n",	" 54200K	.....	95%	203M
1209	0s\n",	" 54250K	.....	95%	245M
1210	0s\n",	" 54300K	.....	95%	210M
1211	0s\n",	" 54350K	.....	95%	184M
1212	0s\n",	" 54400K	.....	95%	239M
1213	0s\n",	" 54450K	.....	95%	235M
1214	0s\n",	" 54500K	.....	95%	208M
1215	0s\n",	" 54550K	.....	95%	207M
1216	0s\n",	" 54600K	.....	95%	224M
1217	0s\n",	" 54650K	.....	95%	212M
1218	0s\n",	" 54700K	.....	95%	238M
1219	0s\n",	" 54750K	.....	95%	2.01M
1220	0s\n",	" 54800K	.....	96%	254M
1221	0s\n",	" 54850K	.....	96%	294M
1222	0s\n",	" 54900K	.....	96%	297M
1223	0s\n",	" 54950K	.....	96%	266M
1224	0s\n",	" 55000K	.....	96%	23.7M
1225	0s\n",	" 55050K	.....	96%	238M
1226	0s\n",	" 55100K	.....	96%	283M
1227	0s\n",	" 55150K	.....	96%	242M
1228	0s\n",	" 55200K	.....	96%	292M
1229	0s\n",	" 55250K	.....	96%	212M
1230	0s\n",	" 55300K	.....	96%	223M

1231	0s\n",	" 55350K	.....	97%	215M
1232	0s\n",	" 55400K	.....	97%	223M
1233	0s\n",	" 55450K	.....	97%	261M
1234	0s\n",	" 55500K	.....	97%	260M
1235	0s\n",	" 55550K	.....	97%	192M
1236	0s\n",	" 55600K	.....	97%	251M
1237	0s\n",	" 55650K	.....	97%	267M
1238	0s\n",	" 55700K	.....	97%	257M
1239	0s\n",	" 55750K	.....	97%	220M
1240	0s\n",	" 55800K	.....	97%	241M
1241	0s\n",	" 55850K	.....	97%	240M
1242	0s\n",	" 55900K	.....	97%	260M
1243	0s\n",	" 55950K	.....	98%	214M
1244	0s\n",	" 56000K	.....	98%	4.74M
1245	0s\n",	" 56050K	.....	98%	85.4M
1246	0s\n",	" 56100K	.....	98%	231M
1247	0s\n",	" 56150K	.....	98%	118M
1248	0s\n",	" 56200K	.....	98%	246M
1249	0s\n",	" 56250K	.....	98%	258M
1250	0s\n",	" 56300K	.....	98%	229M
1251	0s\n",	" 56350K	.....	98%	182M
1252	0s\n",	" 56400K	.....	98%	209M
1253	0s\n",	" 56450K	.....	98%	203M
1254	0s\n",	" 56500K	.....	99%	201M
1255	0s\n",	" 56550K	.....	99%	9.05M
1256	0s\n",	" 56600K	.....	99%	221M
1257	0s\n",	" 56650K	.....	99%	235M
1258	0s\n",	" 56700K	.....	99%	233M
1259	0s\n",	" 56750K	.....	99%	185M
1260	0s\n",	" 56800K	.....	99%	216M
1261	0s\n",	" 56850K	.....	99%	248M


```

1262 0s\n",
      " 56900K ..... 99% 231M
1263 0s\n",
      " 56950K ..... 99% 14.7M
1264 0s\n",
      " 57000K ..... 99% 217M
1265 0s\n",
      " 57050K ..... 100% 238M
=0.9s\n",
      "\n",
1266 "2022-04-20 19:57:27 (63.7 MB/s) - 'Miniconda3-4.5.4-Linux-x86_64.'sh
1267 saved [58468498/58468498]\n",
      "\n",
1268 "Python 3.6.5 :: Anaconda, Inc.\n"
1269 ]
1270 }
1271 ]
1272 },
1273 {
1274 "cell_type": "code",
1275 "source": [
1276 " !which conda # should return /usr/local/bin/conda\n",
1277 " !conda --version # should return 4.5.4\n",
1278 " !which python # still returns /usr/local/bin/python\n",
1279 " !python --version # now returns Python 3.6.5 :: Anaconda, Inc."
1280 ],
1281 "metadata": {
1282 "colab": {
1283 "base_uri": "https://localhost:8080/"
1284 },
1285 "id": "ff02S7hCjDeP",
1286 "outputId": "2d68e11a-40b9-445b-c7e5-ebbdb2799a7c"
1287 },
1288 "execution_count": 3,
1289 "outputs": [
1290 {
1291 "output_type": "stream",
1292 "name": "stdout",
1293 "text": [
1294 "/usr/local/bin/conda\n",
1295 "conda 4.5.4\n",
1296 "/usr/local/bin/python\n",
1297 "Python 3.6.5 :: Anaconda, Inc.\n"
1298 ]
1299 }
1300 ]
1301 },
1302 {
1303 "cell_type": "code",
1304 "source": [
1305 "#update conda\n",
1306 "%bash\n",
1307 "conda install --channel defaults conda python=3.6 --yes\n",
1308 "conda update --channel defaults --all --yes"
1309 ],
1310 "metadata": {
1311 "colab": {
1312 "base_uri": "https://localhost:8080/"
1313 },
1314 "id": "pfF4vhcxjDgZ",
1315 "outputId": "603bbfec-e16f-4d07-dfb9-4318bc3ff104"
1316 },
1317

```

```

1318     "execution_count": 4,
1319     "outputs": [
1320     {
1321         "output_type": "stream",
1322         "name": "stdout",
1323         "text": [
1324             "Solving environment: ...working... done\n",
1325             "\n",
1326             "## Package Plan ##\n",
1327             "\n",
1328             "  environment location: /usr/local\n",
1329             "\n",
1330             "  added / updated specs: \n",
1331             "    - conda\n",
1332             "    - python=3.6\n",
1333             "\n",
1334             "\n",
1335             "The following packages will be downloaded:\n",
1336             "\n",
1337             "  package | build\n",
1338             "  -----|-----\n",
1339             "  six-1.16.0 | pyhd3eb1b0_1 | 19 KB\n",
1340             "  pyopenssl-22.0.0 | pyhd3eb1b0_0 | 49 KB\n",
1341             "  urllib3-1.26.8 | pyhd3eb1b0_0 | 100 KB\n",
1342             "  xz-5.2.5 | h7b6447c_0 | 438 KB\n",
1343             "  pycosat-0.6.3 | py36h27cfd23_0 | 107 KB\n",
1344             "  pycparser-2.21 | pyhd3eb1b0_0 | 94 KB\n",
1345             "  yaml-0.2.5 | h7b6447c_0 | 87 KB\n",
1346             "  conda-package-handling-1.7.3 | py36h27cfd23_1 | 946 KB\n",
1347             "  setuptools-58.0.4 | py36h06a4308_0 | 979 KB\n",
1348             "  cryptography-35.0.0 | py36hd23ed53_0 | 1.5 MB\n",
1349             "  idna-3.3 | pyhd3eb1b0_0 | 55 KB\n",
1350             "  pip-21.2.2 | py36h06a4308_0 | 2.1 MB\n",
1351             "  ld_impl_linux-64-2.35.1 | h7274673_9 | 54 KB\n",
1352             "  libffi-3.3 | he6710b0_2 | 136 KB\n",
1353             "  zlib-1.2.12 | h7f8727e_1 | 32.5 MB\n",
1354             "  python-3.6.13 | h12debd9_1 | 141 KB\n",
1355             "  certifi-2021.5.30 | py36h06a4308_0 | 33 KB\n",
1356             "  charset-normalizer-2.0.4 | pyhd3eb1b0_0 | 31 KB\n",
1357             "  wheel-0.37.1 | pyhd3eb1b0_0 | 30 KB\n",
1358             "  pysocks-1.7.1 | py36h06a4308_0 | 21 KB\n",
1359             "  colorama-0.4.4 | pyhd3eb1b0_0 | 129 KB\n",
1360             "  ca-certificates-2022.3.29 | h06a4308_1 | 1.0 MB\n",
1361             "  ncurses-6.3 | h7f8727e_2 | 268 KB\n",
1362             "  ruamel_yaml-0.15.100 | py36h27cfd23_0 | 423 KB\n",
1363             "  readline-8.1.2 | h7f8727e_1 | 349 KB\n",
1364             "  brotli-0.7.0 | py36h27cfd23_1003 | 4.0 MB\n",
1365             "  libstdcxx-ng-9.1.0 | hdf63c60_0 | 8.1 MB\n",
1366             "  libgcc-ng-9.1.0 | hdf63c60_0 | 3.8 MB\n",
1367             "  openssl-1.1.1n | h7f8727e_0 | 3 KB\n",
1368             "  _libgcc_mutex-0.1 | main | 3.2 MB\n",
1369             "  tk-8.6.11 | h1ccaba5_0 | 80 KB\n",
1370             "  tqdm-4.63.0 | pyhd3eb1b0_0 | 3.1 MB\n",
1371             "  conda-4.10.3 | py36h06a4308_0 | 224 KB\n",
1372             "  cffi-1.14.6 | py36h400218f_0 | 1.5 MB\n",
1373             "  sqlite-3.38.2 | hc218d9a_0 | 52 KB\n",
1374             "  requests-2.27.1 | pyhd3eb1b0_0 | \n",
1375             "  -----\n",
1376             "  Total: 66.1 MB\n",
1377             "\n",
1378             "The following NEW packages will be INSTALLED:\n",
1379             "\n",

```

```

1380         "    _libgcc_mutex:      0.1-main          \n",
1381         "    brotli:                 0.7.0-py36h27cfd23_1003\n",
1382         "    charset-normalizer:      2.0.4-pyhd3eb1b0_0    \n",
1383         "    colorama:                 0.4.4-pyhd3eb1b0_0    \n",
1384         "    conda-package-handling:  1.7.3-py36h27cfd23_1    \n",
1385         "    ld_impl_linux-64:        2.35.1-h7274673_9    \n",
1386         "    tqdm:                     4.63.0-pyhd3eb1b0_0    \n",
1387         "\n",
1388         "The following packages will be UPDATED:\n",
1389         "\n",
1390         "    ca-certificates:          2018.03.07-0           --> 2022.3.29-
h06a4308_1    \n",
1391         "    certifi:                  2018.4.16-py36_0       --> 2021.5.30-
py36h06a4308_0\n",
1392         "    cffi:                     1.11.5-py36h9745a5d_0  --> 1.14.6-
py36h400218f_0    \n",
1393         "    conda:                    4.5.4-py36_0           --> 4.10.3-
py36h06a4308_0    \n",
1394         "    cryptography:            2.2.2-py36h14c3975_0   --> 35.0.0-
py36hd23ed53_0    \n",
1395         "    idna:                     2.6-py36h82fb2a8_1     --> 3.3-pyhd3eb1b0_0
\n",
1396         "    libffi:                   3.2.1-hd88cf55_4       --> 3.3-he6710b0_2
\n",
1397         "    libgcc-ng:                7.2.0-hdf63c60_3       --> 9.1.0-hdf63c60_0
\n",
1398         "    libstdcxx-ng:             7.2.0-hdf63c60_3       --> 9.1.0-hdf63c60_0
\n",
1399         "    ncurses:                  6.1-hf484d3e_0         --> 6.3-h7f8727e_2
\n",
1400         "    openssl:                  1.0.2o-h20670df_0      --> 1.1.1n-h7f8727e_0
\n",
1401         "    pip:                      10.0.1-py36_0           --> 21.2.2-
py36h06a4308_0    \n",
1402         "    pycosat:                  0.6.3-py36h0a5515d_0   --> 0.6.3-
py36h27cfd23_0    \n",
1403         "    pycparser:                2.18-py36hf9f622e_1     --> 2.21-pyhd3eb1b0_0
\n",
1404         "    pyopenssl:                18.0.0-py36_0           --> 22.0.0-
pyhd3eb1b0_0    \n",
1405         "    pysocks:                  1.6.8-py36_0           --> 1.7.1-
py36h06a4308_0    \n",
1406         "    python:                   3.6.5-hc3d631a_2        --> 3.6.13-h12debd9_1
\n",
1407         "    readline:                 7.0-ha6073c6_4         --> 8.1.2-h7f8727e_1
\n",
1408         "    requests:                 2.18.4-py36he2e5f8d_1   --> 2.27.1-
pyhd3eb1b0_0    \n",
1409         "    ruamel_yaml:              0.15.37-py36h14c3975_2  --> 0.15.100-
py36h27cfd23_0    \n",
1410         "    setuptools:               39.2.0-py36_0           --> 58.0.4-
py36h06a4308_0    \n",
1411         "    six:                      1.11.0-py36h372c433_1   --> 1.16.0-
pyhd3eb1b0_1    \n",
1412         "    sqlite:                   3.23.1-he433501_0       --> 3.38.2-hc218d9a_0
\n",
1413         "    tk:                       8.6.7-hc745277_3        --> 8.6.11-h1ccaba5_0
\n",
1414         "    urllib3:                  1.22-py36hbe7ace6_0     --> 1.26.8-
pyhd3eb1b0_0    \n",
1415         "    wheel:                    0.31.1-py36_0           --> 0.37.1-
pyhd3eb1b0_0    \n",

```

```

1416         "      xz:                        5.2.4-h14c3975_4      --> 5.2.5-h7b6447c_0
1417         \n",
1418         "      yaml:                      0.1.7-had09818_2      --> 0.2.5-h7b6447c_0
1419         \n",
1420         "      zlib:                      1.2.11-ha838bed_2      --> 1.2.12-h7f8727e_1
1421         \n",
1422         "\n",
1423         "Downloading and Extracting Packages\n",
1424         "Preparing transaction: ...working... done\n",
1425         "Verifying transaction: ...working... done\n",
1426         "Executing transaction: ...working... done\n",
1427         "Collecting package metadata (current_repodata.json): ...working... done\n",
1428     ",
1429     "Solving environment: ...working... done\n",
1430     "\n",
1431     "## Package Plan ##\n",
1432     "\n",
1433     "  environment location: /usr/local\n",
1434     "\n",
1435     "\n",
1436     "The following packages will be downloaded:\n",
1437     "\n",
1438     "  package | build\n",
1439     "  -----|-----\n",
1440     "  _openmp_mutex-4.5 | 1_gnu 22 KB\n",
1441     "  libgcc-ng-9.3.0 | h5101ec6_17 4.8 MB\n",
1442     "  libgomp-9.3.0 | h5101ec6_17 311 KB\n",
1443     "  libstdcxx-ng-9.3.0 | hd4cf53a_17 3.1 MB\n",
1444     "  -----|-----\n",
1445     "  Total: 8.2 MB\n",
1446     "\n",
1447     "The following NEW packages will be INSTALLED:\n",
1448     "\n",
1449     "  _openmp_mutex      pkgs/main/linux-64::_openmp_mutex-4.5-1_gnu\n",
1450     "  libgomp            pkgs/main/linux-64::libgomp-9.3.0-h5101ec6_17\n",
1451     "\n",
1452     "The following packages will be REMOVED:\n",
1453     "\n",
1454     "  asn1crypto-0.24.0-py36_0\n",
1455     "  chardet-3.0.4-py36h0f667ec_1\n",
1456     "  conda-env-2.6.0-h36134e3_1\n",
1457     "  libedit-3.1.20170329-h6b74fd2_2\n",
1458     "\n",
1459     "The following packages will be UPDATED:\n",
1460     "\n",
1461     "  libgcc-ng          9.1.0-hdf63c60_0 --> 9.3.0-h5101ec6_17\n",
1462     "  libstdcxx-ng       9.1.0-hdf63c60_0 --> 9.3.0-hd4cf53a_17\n",
1463     "\n",
1464     "\n",
1465     "Downloading and Extracting Packages\n",
1466     "\r\nlibstdcxx-ng-9.3.0 | 3.1 MB | 0% \r\nlibstdcxx-ng-9.3.0 | 3.1 MB | ##### | 100% \r\nlibstdcxx-ng-9.3.0 | 3.1 MB | 0% \r\nlibstdcxx-ng-9.3.0 | 3.1 MB | ##### | 100% \n",
1467     "\r\n_openmp_mutex-4.5 | 22 KB | 0% \r\n_openmp_mutex-4.5 | 22 KB | ##### | 100% \n",
1468     "\r\nlibgcc-ng-9.3.0 | 4.8 MB | 0% \r\nlibgcc-ng-9.3.0 | 4.8 MB | ##### | 100% \r\nlibgcc-ng-9.3.0 | 4.8 MB | ##### | 100% \n",

```

```

1467         "\libgomp-9.3.0          | 311 KB |          | 0% \libgomp-9.3.0
      | 311 KB | ##### | 100% \n",
1468     "Preparing transaction: ...working... done\n",
1469     "Verifying transaction: ...working... done\n",
1470     "Executing transaction: ...working... done\n"
1471 ]
1472 },
1473 {
1474     "output_type": "stream",
1475     "name": "stderr",
1476     "text": [
1477         "\rsix-1.16.0          | 19 KB |          | 0% \rsix-1.16.0
      | 19 KB | ##### | 100% \n",
1478         "\rpyopenssl-22.0.0     | 49 KB |          | 0% \rpyopenssl-22.0.0
      | 49 KB | ##### | 100% \n",
1479         "\rurllib3-1.26.8        | 100 KB |          | 0% \rurllib3-1.26.8
      | 100 KB | ##### | 100% \n",
1480         "\rxz-5.2.5             | 438 KB |          | 0% \rxz-5.2.5
      | 438 KB | ##### | 90% \rxz-5.2.5 | 438 KB | ##### |
100% \n",
1481         "\rpycosat-0.6.3         | 107 KB |          | 0% \rpycosat-0.6.3
      | 107 KB | ##### | 100% \n",
1482         "\rpycparser-2.21        | 94 KB |          | 0% \rpycparser-2.21
      | 94 KB | ##### | 100% \n",
1483         "\ryaml-0.2.5           | 87 KB |          | 0% \ryaml-0.2.5
      | 87 KB | ##### | 100% \n",
1484         "\rconda-package-handli | 946 KB |          | 0% \rconda-package-
handli | 946 KB | #####7 | 87% \rconda-package-handli | 946 KB | #####
| 100% \n",
1485         "\rsetuptools-58.0.4   | 979 KB |          | 0% \rsetuptools-58.0.4
      | 979 KB | #####9 | 80% \rsetuptools-58.0.4 | 979 KB | #####6 |
97% \rsetuptools-58.0.4 | 979 KB | ##### | 100% \n",
1486         "\rcryptography-35.0.0 | 1.5 MB |          | 0% \rcryptography
-35.0.0 | 1.5 MB | #####7 | 77% \rcryptography-35.0.0 | 1.5 MB |
#####4 | 94% \rcryptography-35.0.0 | 1.5 MB | ##### | 100% \n",
1487         "\ridna-3.3           | 55 KB |          | 0% \ridna-3.3
      | 55 KB | ##### | 100% \n",
1488         "\rpip-21.2.2          | 2.1 MB |          | 0% \rpip-21.2.2
      | 2.1 MB | #####9 | 79% \rpip-21.2.2 | 2.1 MB | ##### |
100% \n",
1489         "\rld_impl_linux-64-2.3 | 637 KB |          | 0% \rld_impl_linux
-64-2.3 | 637 KB | #####1 | 92% \rld_impl_linux-64-2.3 | 637 KB |
##### | 100% \n",
1490         "\rlibffi-3.3          | 54 KB |          | 0% \rlibffi-3.3
      | 54 KB | ##### | 100% \n",
1491         "\rzlib-1.2.12         | 136 KB |          | 0% \rzlib-1.2.12
      | 136 KB | ##### | 100% \n",
1492         "\rpython-3.6.13        | 32.5 MB |          | 0% \rpython-3.6.13
      | 32.5 MB | #9 | 19% \rpython-3.6.13 | 32.5 MB | ##### |
50% \rpython-3.6.13 | 32.5 MB | #####5 | 75% \rpython-3.6.13 |
32.5 MB | #####1 | 92% \rpython-3.6.13 | 32.5 MB | ##### | 100% \
n",
1493         "\rcertifi-2021.5.30   | 141 KB |          | 0% \rcertifi-2021.5.30
      | 141 KB | ##### | 100% \n",
1494         "\rcharset-normalizer-2 | 33 KB |          | 0% \rcharset-normalizer
-2 | 33 KB | ##### | 100% \n",
1495         "\rwheel-0.37.1         | 31 KB |          | 0% \rwheel-0.37.1
      | 31 KB | ##### | 100% \n",
1496         "\rpysocks-1.7.1        | 30 KB |          | 0% \rpysocks-1.7.1
      | 30 KB | ##### | 100% \n",
1497         "\rcolorama-0.4.4        | 21 KB |          | 0% \rcolorama-0.4.4
      | 21 KB | ##### | 100% \n",

```

```

1498         "\rca-certificates-2022 | 129 KB | | 0% \rca-certificates
-2022 | 129 KB | ##### | 100% \n",
1499         "\rncurses-6.3 | 1.0 MB | | 0% \rncurses-6.3
| 1.0 MB | #####2 | 83% \rncurses-6.3 | 1.0 MB | ##### |
100% \n",
1500         "\rruamel_yaml-0.15.100 | 268 KB | | 0% \rruamel_yaml
-0.15.100 | 268 KB | ##### | 100% \n",
1501         "\rreadline-8.1.2 | 423 KB | | 0% \rreadline-8.1.2
| 423 KB | ##### | 100% \n",
1502         "\rbrotlipy-0.7.0 | 349 KB | | 0% \rbrotlipy-0.7.0
| 349 KB | ##### | 100% \n",
1503         "\rlibstdcxx-ng-9.1.0 | 4.0 MB | | 0% \rlibstdcxx-ng-9.1.0
| 4.0 MB | ##### | 77% \rlibstdcxx-ng-9.1.0 | 4.0 MB | #####8 |
99% \rlibstdcxx-ng-9.1.0 | 4.0 MB | ##### | 100% \n",
1504         "\rlibgcc-ng-9.1.0 | 8.1 MB | | 0% \rlibgcc-ng-9.1.0
| 8.1 MB | #####5 | 76% \rlibgcc-ng-9.1.0 | 8.1 MB | #####8 |
98% \rlibgcc-ng-9.1.0 | 8.1 MB | ##### | 100% \n",
1505         "\ropenssl-1.1.1n | 3.8 MB | | 0% \ropenssl-1.1.1n
| 3.8 MB | #####7 | 77% \ropenssl-1.1.1n | 3.8 MB | #####7 |
98% \ropenssl-1.1.1n | 3.8 MB | ##### | 100% \n",
1506         "\r_libgcc_mutex-0.1 | 3 KB | | 0% \r_libgcc_mutex-0.1
| 3 KB | ##### | 100% \n",
1507         "\rtk-8.6.11 | 3.2 MB | | 0% \rtk-8.6.11
| 3.2 MB | #####6 | 77% \rtk-8.6.11 | 3.2 MB | #####1 |
91% \rtk-8.6.11 | 3.2 MB | ##### | 100% \n",
1508         "\rtqdm-4.63.0 | 80 KB | | 0% \rtqdm-4.63.0
| 80 KB | ##### | 100% \n",
1509         "\rconda-4.10.3 | 3.1 MB | | 0% \rconda-4.10.3
| 3.1 MB | #####1 | 81% \rconda-4.10.3 | 3.1 MB | #####8 |
99% \rconda-4.10.3 | 3.1 MB | ##### | 100% \n",
1510         "\rcffi-1.14.6 | 224 KB | | 0% \rcffi-1.14.6
| 224 KB | ##### | 100% \n",
1511         "\rsqlite-3.38.2 | 1.5 MB | | 0% \rsqlite-3.38.2
| 1.5 MB | #####2 | 83% \rsqlite-3.38.2 | 1.5 MB | ##### |
100% \n",
1512         "\rrequests-2.27.1 | 52 KB | | 0% \rrequests-2.27.1
| 52 KB | ##### | 100% \n",
1513         "\n",
1514         "\n",
1515         "==> WARNING: A newer version of conda exists. <==\n",
1516         " current version: 4.10.3\n",
1517         " latest version: 4.12.0\n",
1518         "\n",
1519         "Please update conda by running\n",
1520         "\n",
1521         " $ conda update -n base -c defaults conda\n",
1522         "\n",
1523         "\n"
1524     ]
1525 }
1526 ]
1527 },
1528 {
1529     "cell_type": "code",
1530     "source": [
1531         "!conda --version # now returns 4.8.3"
1532     ],
1533     "metadata": {
1534         "colab": {
1535             "base_uri": "https://localhost:8080/"
1536         },
1537         "id": "oUnSawnqjDid",

```

```

1538     "outputId": "4cdc7d3f-a2a9-44d0-dd78-271f613df8fc"
1539 },
1540 "execution_count": 5,
1541 "outputs": [
1542   {
1543     "output_type": "stream",
1544     "name": "stdout",
1545     "text": [
1546       "conda 4.10.3\n"
1547     ]
1548   }
1549 ]
1550 },
1551 {
1552   "cell_type": "code",
1553   "source": [
1554     "import sys\n",
1555     "sys.path"
1556   ],
1557   "metadata": {
1558     "colab": {
1559       "base_uri": "https://localhost:8080/"
1560     },
1561     "id": "hlvK3f2XjDko",
1562     "outputId": "c837c810-f3eb-4fab-d88b-aeaac9c1cc0c"
1563   },
1564   "execution_count": 6,
1565   "outputs": [
1566     {
1567       "output_type": "execute_result",
1568       "data": {
1569         "text/plain": [
1570           "['',\n",
1571            " '/content',\n",
1572            " '/env/python',\n",
1573            " '/usr/lib/python37.zip',\n",
1574            " '/usr/lib/python3.7',\n",
1575            " '/usr/lib/python3.7/lib-dynload',\n",
1576            " '/usr/local/lib/python3.7/dist-packages',\n",
1577            " '/usr/lib/python3/dist-packages',\n",
1578            " '/usr/local/lib/python3.7/dist-packages/IPython/extensions',\n",
1579            " '/root/.ipython']"
1580         ]
1581       },
1582       "metadata": {},
1583       "execution_count": 6
1584     }
1585   ]
1586 },
1587 {
1588   "cell_type": "code",
1589   "source": [
1590     "#install megahit\n",
1591     "!conda install -c bioconda megahit\n",
1592     "!wget https://github.com/voutcn/megahit/releases/download/v1.2.9/MEGAHIT-1.2.9-Linux-x86_64-static.tar.gz\n",
1593     "!tar zvxf MEGAHIT-1.2.9-Linux-x86_64-static.tar.gz"
1594   ],
1595   "metadata": {
1596     "colab": {
1597       "base_uri": "https://localhost:8080/"
1598     }
1599   },

```



```

1655         "Location: https://objects.githubusercontent.com/github-production-release
-asset-2e65be/24453792/3ad7e300-eebc-11e9-8143-571e0731c2d5?X-Amz-Algorithm=AWS4-
HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20220420%2Fus-east-1%2Fs3%2
Faws4_request&X-Amz-Date=20220420T195919Z&X-Amz-Expires=300&X-Amz-Signature=
ca0c7d844a01719016d8f0bd693c33fd63ac4ff1609be498b598a11ea57b6ee5&X-Amz-
SignedHeaders=host&actor_id=0&key_id=0&repo_id=24453792&response-content-
disposition=attachment%3B%20filename%3DMEGAHIT-1.2.9-Linux-x86_64-static.tar.gz&
response-content-type=application%2Foctet-stream [following]\n",
1656         "--2022-04-20 19:59:19-- https://objects.githubusercontent.com/github-
production-release-asset-2e65be/24453792/3ad7e300-eebc-11e9-8143-571e0731c2d5?X-
Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20220420%2
Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20220420T195919Z&X-Amz-Expires=300&X-Amz-
Signature=ca0c7d844a01719016d8f0bd693c33fd63ac4ff1609be498b598a11ea57b6ee5&X-Amz-
SignedHeaders=host&actor_id=0&key_id=0&repo_id=24453792&response-content-
disposition=attachment%3B%20filename%3DMEGAHIT-1.2.9-Linux-x86_64-static.tar.gz&
response-content-type=application%2Foctet-stream\n",
1657         "Resolving objects.githubusercontent.com (objects.githubusercontent.com)
... 185.199.108.133, 185.199.109.133, 185.199.110.133, ...\n",
1658         "Connecting to objects.githubusercontent.com (objects.githubusercontent.
com)|185.199.108.133|:443... connected.\n",
1659         "HTTP request sent, awaiting response... 200 OK\n",
1660         "Length: 8643066 (8.2M) [application/octet-stream]\n",
1661         "Saving to: 'MEGAHIT-1.2.9-Linux-x86_64-static.tar.gz'\n",
1662         "\n",
1663         "MEGAHIT-1.2.9-Linux 100%[=====>] 8.24M --.-KB/s in
0.04s \n",
1664         "\n",
1665         "2022-04-20 19:59:19 (216 MB/s) - 'MEGAHIT-1.2.9-Linux-x86_64-static.tar.
'gz saved [8643066/8643066]\n",
1666         "\n",
1667         "MEGAHIT-1.2.9-Linux-x86_64-static/\n",
1668         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/\n",
1669         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit\n",
1670         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_core\n",
1671         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_toolkit\n",
1672         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_core_no_hw_accel\n",
1673         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_core_popcnt\n",
1674         "MEGAHIT-1.2.9-Linux-x86_64-static/share/\n",
1675         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/\n",
1676         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/\n",
1677         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r3.1.fa\n",
1678         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/
generate_random_fasta.py\n",
1679         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r4.fa\n",
1680         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/empty.fa\n",
1681         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r3.1.fa\n",
1682         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r2.il.fa.bz2\n"
,
1683         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/ref.fa\n",
1684         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r1.il.fa.gz\n",
1685         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/loop.fa\n"
1686     ]
1687 }
1688 ]
1689 },
1690 {
1691     "cell_type": "code",
1692     "source": [
1693         "!conda update -n base -c defaults conda"
1694     ],
1695     "metadata": {
1696         "colab": {

```

```

1697     "base_uri": "https://localhost:8080/"
1698   },
1699   "id": "JwI1n-CejDqy",
1700   "outputId": "e1513b5a-4f90-470a-cfa1-60c6e3cf44d4"
1701 },
1702 "execution_count": 8,
1703 "outputs": [
1704   {
1705     "output_type": "stream",
1706     "name": "stdout",
1707     "text": [
1708       "Collecting package metadata (current_repodata.json): - \b\b\\ \b\b| \b\b/
\b\b- \b\b\\ \b\b| \b\bdone\n",
1709       "Solving environment: / \b\b- \b\b\\ \b\b| \b\b/ \b\b- \b\b\\ \b\b| \b\b/
\b\bdone\n",
1710       "\n",
1711       "\n",
1712       "==> WARNING: A newer version of conda exists. <==\n",
1713       "  current version: 4.10.3\n",
1714       "  latest version: 4.12.0\n",
1715       "\n",
1716       "Please update conda by running\n",
1717       "\n",
1718       "  $ conda update -n base -c defaults conda\n",
1719       "\n",
1720       "\n",
1721       "\n",
1722       "# All requested packages already installed.\n",
1723       "\n"
1724     ]
1725   }
1726 ],
1727 },
1728 {
1729   "cell_type": "code",
1730   "source": [
1731     "#install megahit\n",
1732     "!conda install -c bioconda megahit\n",
1733     "!wget https://github.com/voutcn/megahit/releases/download/v1.2.9/MEGAHIT
-1.2.9-Linux-x86_64-static.tar.gz\n",
1734     "!tar zvxf MEGAHIT-1.2.9-Linux-x86_64-static.tar.gz"
1735   ],
1736   "metadata": {
1737     "colab": {
1738       "base_uri": "https://localhost:8080/"
1739     },
1740     "id": "mWbC48FHjDtr",
1741     "outputId": "44f910b5-dd3e-403a-8928-42096fdb104e"
1742   },
1743   "execution_count": 9,
1744   "outputs": [
1745     {
1746       "output_type": "stream",
1747       "name": "stdout",
1748       "text": [
1749         "Collecting package metadata (current_repodata.json): - \b\b\\ \b\b| \b\b/
\b\b- \b\b\\ \b\b| \b\b/ \b\b- \b\b\\ \b\b| \b\bdone\n",
1750         "Solving environment: / \b\b- \b\b\\ \b\b| \b\b/ \b\bdone\n",
1751         "\n",
1752         "\n",
1753         "==> WARNING: A newer version of conda exists. <==\n",
1754         "  current version: 4.10.3\n",

```

```

1755         " latest version: 4.12.0\n",
1756         "\n",
1757         "Please update conda by running\n",
1758         "\n",
1759         " $ conda update -n base -c defaults conda\n",
1760         "\n",
1761         "\n",
1762         "\n",
1763         "# All requested packages already installed.\n",
1764         "\n",
1765         "--2022-04-20 19:59:34-- https://github.com/voutcn/megahit/releases/
download/v1.2.9/MEGAHIT-1.2.9-Linux-x86_64-static.tar.gz\n",
1766         "Resolving github.com (github.com)... 140.82.112.3\n",
1767         "Connecting to github.com (github.com)|140.82.112.3|:443... connected.\n",
1768         "HTTP request sent, awaiting response... 302 Found\n",
1769         "Location: https://objects.githubusercontent.com/github-production-release
-asset-2e65be/24453792/3ad7e300-eebc-11e9-8143-571e0731c2d5?X-Amz-Algorithm=AWS4-
HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20220420%2Fus-east-1%2Fs3%2
Faws4_request&X-Amz-Date=20220420T195934Z&X-Amz-Expires=300&X-Amz-Signature=
aaf93c68a47b9ce7577b9641de891b1f97ea6871c977c0435372cee3f1972560&X-Amz-
SignedHeaders=host&actor_id=0&key_id=0&repo_id=24453792&response-content-
disposition=attachment%3B%20filename%3DMEGAHIT-1.2.9-Linux-x86_64-static.tar.gz&
response-content-type=application%2Foctet-stream [following]\n",
1770         "--2022-04-20 19:59:34-- https://objects.githubusercontent.com/github-
production-release-asset-2e65be/24453792/3ad7e300-eebc-11e9-8143-571e0731c2d5?X-
Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20220420%2
Fus-east-1%2Fs3%2Faws4_request&X-Amz-Date=20220420T195934Z&X-Amz-Expires=300&X-Amz-
Signature=aaf93c68a47b9ce7577b9641de891b1f97ea6871c977c0435372cee3f1972560&X-Amz-
SignedHeaders=host&actor_id=0&key_id=0&repo_id=24453792&response-content-
disposition=attachment%3B%20filename%3DMEGAHIT-1.2.9-Linux-x86_64-static.tar.gz&
response-content-type=application%2Foctet-stream\n",
1771         "Resolving objects.githubusercontent.com (objects.githubusercontent.com)
... 185.199.109.133, 185.199.111.133, 185.199.108.133, ... \n",
1772         "Connecting to objects.githubusercontent.com (objects.githubusercontent.
com)|185.199.109.133|:443... connected.\n",
1773         "HTTP request sent, awaiting response... 200 OK\n",
1774         "Length: 8643066 (8.2M) [application/octet-stream]\n",
1775         "Saving to: 'MEGAHIT-1.2.9-Linux-x86_64-static.tar.gz'.1\n",
1776         "\n",
1777         "MEGAHIT-1.2.9-Linux 100%[=====>] 8.24M --.-KB/s in
0.03s
1778         "\n",
1779         "2022-04-20 19:59:34 (298 MB/s) - 'MEGAHIT-1.2.9-Linux-x86_64-static.tar.
gz'.1 saved [8643066/8643066]\n",
1780         "\n",
1781         "MEGAHIT-1.2.9-Linux-x86_64-static/\n",
1782         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/\n",
1783         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit\n",
1784         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_core\n",
1785         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_toolkit\n",
1786         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_core_no_hw_accel\n",
1787         "MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit_core_popcnt\n",
1788         "MEGAHIT-1.2.9-Linux-x86_64-static/share/\n",
1789         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/\n",
1790         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/\n",
1791         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r3_2.fa\n",
1792         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/
generate_random_fasta.py\n",
1793         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r4.fa\n",
1794         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/empty.fa\n",
1795         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r3_1.fa\n",
1796         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r2.il.fa.bz2\n"

```

```

1797     ,
1798         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/ref.fa\n",
1799         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/r1.il.fa.gz\n",
1800         "MEGAHIT-1.2.9-Linux-x86_64-static/share/megahit/test_data/loop.fa\n"
1801     ]
1802 }
1803 },
1804 {
1805     "cell_type": "code",
1806     "source": [
1807         "#run megahit\n",
1808         "!./MEGAHIT-1.2.9-Linux-x86_64-static/bin/megahit"
1809     ],
1810     "metadata": {
1811         "colab": {
1812             "base_uri": "https://localhost:8080/"
1813         },
1814         "id": "y-fEAjc9jDux",
1815         "outputId": "6fd7ea80-9d2e-4070-868b-a196d3680e20"
1816     },
1817     "execution_count": 10,
1818     "outputs": [
1819         {
1820             "output_type": "stream",
1821             "name": "stdout",
1822             "text": [
1823                 "megahit: MEGAHIT v1.2.9\n",
1824                 "\n",
1825                 "contact: Dinghua Li <voutcn@gmail.com>\n",
1826                 "\n",
1827                 "Usage:\n",
1828                 "  megahit [options] {-1 <pe1> -2 <pe2> | --12 <pe12> | -r <se>} [-o <
out_dir>]\n",
1829                 "\n",
1830                 "  Input options that can be specified for multiple times (supporting
plain text and gz/bz2 extensions)\n",
1831                 "    -1 <pe1>          comma-separated list of fasta
/q paired-end #1 files, paired with files in <pe2>\n",
1832                 "    -2 <pe2>          comma-separated list of fasta
/q paired-end #2 files, paired with files in <pe1>\n",
1833                 "    --12 <pe12>      comma-separated list of
interleaved fasta/q paired-end files\n",
1834                 "    -r/--read <se>   comma-separated list of fasta
/q single-end files\n",
1835                 "\n",
1836                 "Optional Arguments:\n",
1837                 "  Basic assembly options:\n",
1838                 "    --min-count <int>          minimum multiplicity for
filtering (k_min+1)-mers [2]\n",
1839                 "    --k-list <int,int,...>    comma-separated list of kmer
size\n",
1840                 "                                all must be odd, in the range
15-255, increment <= 28)\n",
1841                 "                                [21,29,39,59,79,99,119,141]\n",
1842                 "\n",
1843                 "  Another way to set --k-list (overrides --k-list if one of them set):\n",
1844                 "    --k-min <int>          minimum kmer size (<= 255),
must be odd number [21]\n",
1845                 "    --k-max <int>          maximum kmer size (<= 255),

```

```

1846 must be odd number [141]\n",
      "    --k-step <int> increment of kmer size of
1847 each iteration (<= 28), must be even number [12]\n",
1848 "\n",
1849 "    Advanced assembly options:\n",
1850 "    --no-mercy do not add mercy kmers\n",
      "    --bubble-level <int> intensity of bubble merging
1851 (0-2), 0 to disable [2]\n",
      "    --merge-level <l,s> merge complex bubbles of
1852 length <= l*kmer_size and similarity >= s [20,0.95]\n",
      "    --prune-level <int> strength of low depth pruning
1853 (0-3) [2]\n",
      "    --prune-depth <int> remove unitigs with avg kmer
1854 depth less than this value [2]\n",
      "    --disconnect-ratio <float> disconnect unitigs if its
1855 depth is less than this ratio times \n",
      " the total depth of itself and
1856 its siblings [0.1] \n",
      "    --low-local-ratio <float> remove unitigs if its depth
1857 is less than this ratio times\n",
      " the average depth of the
1858 neighborhoods [0.2]\n",
      "    --max-tip-len <int> remove tips less than this
1859 value [2*k]\n",
      "    --cleaning-rounds <int> number of rounds for graph
1860 cleaning [5]\n",
      "    --no-local disable local assembly\n",
1861 "    --kmin-1pass use 1pass mode to build SDBG
of k_min\n",
1862 "\n",
1863 "    Presets parameters:\n",
1864 "    --presets <str> override a group of
1865 parameters; possible values:\n",
      " meta-sensitive: '--min-count
1866 1 --k-list 21,29,39,49,...,129,141'\n",
      " meta-large: '--k-min 27 --k-
1867 max 127 --k-step 10'\n",
      " (large & complex metagenomes,
1868 like soil)\n",
1869 "\n",
1870 "    Hardware options:\n",
      "    -m/--memory <float> max memory in byte to be used
1871 in SDBG construction\n",
      " (if set between 0-1, fraction
1872 of the machine's total memory) [0.9]\n",
      "    --mem-flag <int> SDBG builder memory mode. 0:
1873 minimum; 1: moderate;\n",
      " others: use all memory
1874 specified by '-m/--memory' [1]\n",
      "    -t/--num-cpu-threads <int> number of CPU threads [# of
1875 logical processors]\n",
      "    --no-hw-accel run MEGAHIT without BMI2 and
1876 POPCNT hardware instructions\n",
1877 "\n",
1878 "    Output options:\n",
      "    -o/--out-dir <string> output directory [./
1879 megahit_out]\n",
      "    --out-prefix <string> output prefix (the contig
1880 file will be OUT_DIR/OUT_PREFIX.contigs.fa)\n",
      "    --min-contig-len <int> minimum length of contigs to
1881 output [200]\n",
      "    --keep-tmp-files keep all temporary files\n",

```

```

1882         "      <string>          set temp directory\n",
1883         "\n",
1884         "Other Arguments:\n",
1885         "      --continue          continue a MEGAHIT run from
its last available check point.\n",
1886         "      please set the output
directory correctly when using this option.\n",
1887         "      --test              run MEGAHIT on a toy test
dataset\n",
1888         "      -h/--help           print the usage message\n",
1889         "      -v/--version        print version\n",
1890         "\n"
1891     ]
1892 }
1893 ]
1894 },
1895 {
1896     "cell_type": "code",
1897     "source": [
1898         "#install glimmer\n",
1899         "%cd ~\n",
1900         "!conda install -c bioconda glimmer\n",
1901         "!wget https://anaconda.org/bioconda/glimmer/3.02/download/linux-64/glimmer
-3.02-3.tar.bz2\n",
1902         "!tar -xvjf glimmer-3.02-3.tar.bz2\n",
1903         "!./bin/glimmer3"
1904     ],
1905     "metadata": {
1906         "colab": {
1907             "base_uri": "https://localhost:8080/"
1908         },
1909         "id": "vwZhS6WDjDxE",
1910         "outputId": "fc2eb07b-12c3-4752-a037-e8a97fcef505"
1911     },
1912     "execution_count": 11,
1913     "outputs": [
1914         {
1915             "output_type": "stream",
1916             "name": "stdout",
1917             "text": [
1918                 "/root\n",
1919                 "Collecting package metadata (current_repodata.json): - \b\b\ \b\b| \b\b/
\b\b- \b\b\ \b\b| \b\b| \b\b/ \b\b- \b\b\ \b\b\ \b\bdone\n",
1920                 "Solving environment: / \b\b- \b\b\ \b\b| \b\bdone\n",
1921                 "\n",
1922                 "\n",
1923                 "==> WARNING: A newer version of conda exists. <=\n",
1924                 "  current version: 4.10.3\n",
1925                 "  latest version: 4.12.0\n",
1926                 "\n",
1927                 "Please update conda by running\n",
1928                 "\n",
1929                 "$ conda update -n base -c defaults conda\n",
1930                 "\n",
1931                 "\n",
1932                 "\n",
1933                 "## Package Plan ##\n",
1934                 "\n",
1935                 "  environment location: /usr/local\n",
1936                 "\n",
1937                 "  added / updated specs:\n",
1938                 "    - glimmer\n",

```

```

1939         "\n",
1940         "\n",
1941         "The following packages will be downloaded:\n",
1942         "\n",
1943         "    package                                |                build\n",
1944         "    -----|-----\n",
1945         "    glimmer-3.02                            |             h1b792b2_5          2.4 MB
1946 bioconda\n",
1947         "    -----\n",
1948         "    Total:                                2.4 MB\n",
1949         "\n",
1950         "The following NEW packages will be INSTALLED:\n",
1951         "\n",
1952         "    glimmer                                bioconda/linux-64::glimmer-3.02-h1b792b2_5\n",
1953         "\n",
1954         "Proceed ([y]/n)? Y\n",
1955         "\n",
1956         "\n",
1957         "Downloading and Extracting Packages\n",
1958         "glimmer-3.02          | 2.4 MB      | : 100% 1.0/1 [00:00<00:00,  1.39it/s]\n",
1959 n",
1960         "Preparing transaction: - \b\bdone\n",
1961         "Verifying transaction: | \b\bdone\n",
1962         "Executing transaction: - \b\bdone\n",
1963         "--2022-04-20 20:00:00-- https://anaconda.org/bioconda/glimmer/3.02/
1964 download/linux-64/glimmer-3.02-3.tar.bz2\n",
1965         "Resolving anaconda.org (anaconda.org)... 104.17.92.24, 104.17.93.24,
1966 2606:4700::6811:5d18, ... \n",
1967         "Connecting to anaconda.org (anaconda.org)|104.17.92.24|:443... connected
1968 .\n",
1969         "HTTP request sent, awaiting response... 302 Found\n",
1970         "Location: https://binstar-cio-packages-prod.s3.amazonaws.com/5669
1971 a4d042cb170a0ef2a1e8/5b468eff0219ba1326ac2148?response-content-disposition=
1972 attachment%3B%20filename%3D%22glimmer-3.02-3.tar.bz2%22%3B%20filename%2A%3DUTF
1973 -8%27%27glimmer-3.02-3.tar.bz2&response-content-type=application%2Ftar&X-Amz-
1974 Algorithm=AWS4-HMAC-SHA256&X-Amz-Expires=60&X-Amz-Date=20220420T200000Z&X-Amz-
1975 SignedHeaders=host&X-Amz-Security-Token=
1976 IQoJb3JpZ22luX2VjEGlIaCkVzLWVhc3QtMSJHMEUCIQDL2S2DL0bZpZw1L2ksIg671Mc%2
1977 FM5WPkwfIXfIH3lvCmAIGd4kFYjW23xSU03udYw9TCKctGx9PZgCopwaD9vGPjAMq%2
1978 BgMIGxAAgGwONTU4NjQw0TgzNzgiDDdfItf4kNV0TukF8yrXAw1MgxLD5%2
1979 BDBYVDkblKpV3SQXj60pAi3LH7012uFJ%2FQpdwi58j0kwH8wJKXwKJBVAxDtqf%2FUFudJRZ%2
1980 FruK12CSMQPp%2
1981 BCtJrVPPhikP0pbQL8qCYgUrHJpYRyFPuVZtdTqLPhlXajrMZ77dIhk0QNucNT4ZF7P1vCVKUYIRNUKVv%2
1982 FL1FiAs574foMKx6UGXZF1q5aifQ%2BxweaXRCZZJbtLK1UUhWAZcy6wbXMIyxfniJK4SNKfE5tgE%2
1983 FAzfpCfNoqV2W%2BbHp880L9t6IOgZc4hrAuPphfktV7WwGamAGuW0RC8DfEBY1od8hM2Het46CCG%2
1984 BFgz2mDBGukL10nsj2z7x54HGydolpPNeiDV2w8m4%2
1985 Fg290T3A6p3d49uobgfjvwCQYeXaSCx4WGeiBfrCX0IkqSL3a20uhms0WmTcviQdPVNqrFMEsuE2eKKW
1986 %2BDEdVmLSrnH7VaGHC15M5RlrXM%2
1987 BXn6PQyywoz31DMNvNgyzmYmeEMbloHHYzfyu4RiMWQFUBqJQZ95RE7u7Lj1lq%2
1988 BvyuyspvNrn5BULnkoXmkLk5kh9gy0gXAj6%2BZNF%2Fa5Y1qNlqRAcFKwdY%2B%2
1989 Bstk9ZfrDkTiY7bKw0Rk0x9mQaSJUci2IBw7P4k107jCii4GTBjq1AWeWI7XbQsgPq870iYVVuQ%2
1990 FjG1jBqDSFiWZ0zXzJm4wyt1jDYDbIpbeJStfazBpzjJo747CjxUe%2B%2FXtA5T06UNmdMw2hs0aafj
1991 %2BiUf7cXs8eD5JK19ISKqyo07sSEKBq6XK5erPQXS9zFYw0weU5Mv0EKFMMtor1%2
1992 Fg30T7dh7XZm0TQy0a7FyQjYDSaqXo5moGNcERSleLf9dmZqdYqlm0sUJk2Q%3D%3D&X-Amz-
1993 Credential=ASIAWUI46DZFMYC5SN4B%2F20220420%2Fus-east-1%2Fs3%2Faws_request&X-Amz-
1994 Signature=73315cef597a2fa9d5c5a0d5d6a7050e01956d2e5c59b8ddea1214c84be3187c [
1995 following]\n",
1996         "--2022-04-20 20:00:00-- https://binstar-cio-packages-prod.s3.amazonaws.
1997 com/5669a4d042cb170a0ef2a1e8/5b468eff0219ba1326ac2148?response-content-disposition
1998 =attachment%3B%20filename%3D%22glimmer-3.02-3.tar.bz2%22%3B%20filename%2A%3DUTF
1999 -8%27%27glimmer-3.02-3.tar.bz2&response-content-type=application%2Ftar&X-Amz-

```

```

Algorithm=AWS4-HMAC-SHA256&X-Amz-Expires=60&X-Amz-Date=20220420T200000Z&X-Amz-
SignedHeaders=host&X-Amz-Security-Token=
IQoJb3JpZ22luX2VjEGlAcXVzLWVhc3QtMSJHMEUCIQDL2S2DL0bzPzW1L2ksIg671Mc%2
FM5WPkwfIXfIH3lvCmAIGd4kFYjW23xSU03udYw9TCKctGx9PZgCopwad9vGPjAMq%2
BgMIGxAAAGwONTU4NjQw0TgzNzgiDDdfItfK4NV0TukF8yrXAw1MgxLD5%2
BDBYVDkblKpV3SQXj60pAi3LH7012uFJ%2FQpdwi58j0kwH8wJKXwKJBVAxDtqf%2FUfudJRZ%2
FruK12CSMQPp%2
BctJrVP HikPOpbQL8qCYgUrHJpYRyFPuVZtdTqLPhlXajrMZ77dIhk0QNucNT4ZF7P1vCVKUYIRNUKVv%2
FLlFiAs574foMKx6UGXZFlq5aifQ%2BxweaXrcZZJbtLK1UUhWazcy6wbXmiyxfniJK4SNKfE5tgE%2
FAzfpCfNoqV2W%2BbHp880L9t6IOgZc4hrAuPphfktV7WwGamAGuW0Rc8DfEBY1od8hM2Het46CCG%2
BFgz2mDBGukL10nsj2z7x54HGydolpPNeiDV2w8m4%2
Fg290T3A6p3d49uobgfjvwCQYeXaSCx4WGeiBfrCX0IkqSL3a20uhms0WmTcviQdPVNqrFMEsuE2eKKW
%2BDEdVmLSrnH7VaGHCl5M5r1rXM%2
BXn6PQyywoz31DMNvNgyzmYmeEMbloHHYzfYu4RiMWQFUBqJQZ95RE7u7Lj1lq%2
BvyuyspvNrn5BULnkoXmkLk5kh9gy0gXAj6%2BZNF%2Fa5YlqNlqRAcFKwdY%2B%2
Bstk9ZfrDkTiY7bKw0RkOx9mQaSJUci2IBw7P4k107jCi4GTBjq1AWeWI7XbQsgPq870iYVVuQ%2
FjGljBqDSFiIWZ0xXzJm4wyt1jDYDbIpbeJStfazBpzjJo747CjxUe%2B%2FXtA5T06UNmdMw2hs0aafj
%2BiUf7cXs8dD5JK19ISKoqyo07sSEKBq6XK5erPQXS9zFYwOweU5Mv0EKFMmtorl%2
Fg30T7dh7XZm0TQy0a7FyQjYDSaqXo5moGNcERSleLf9dmZqdYqlm0sUJk2Q%3D%3D&X-Amz-
Credential=ASIAWUI46DZFMYC5SN4B%2F20220420%2Fus-east-1%2Fs3%2Faws4_request&X-Amz-
Signature=73315cef597a2fa9d5c5a0d5d6a7050e01956d2e5c59b8ddea1214c84be3187c\n",
1968 "Resolving binstar-cio-packages-prod.s3.amazonaws.com (binstar-cio-
packages-prod.s3.amazonaws.com)... 54.231.201.97\n",
1969 "Connecting to binstar-cio-packages-prod.s3.amazonaws.com (binstar-cio-
packages-prod.s3.amazonaws.com)|54.231.201.97|:443... connected.\n",
1970 "HTTP request sent, awaiting response... 200 OK\n",
1971 "Length: 1253634 (1.2M) [application/x-tar]\n",
1972 "Saving to: 'glimmer-3.02-3.tar.bz2\n",
1973 "\n",
1974 "glimmer-3.02-3.tar. 100%[=====>] 1.20M --.-KB/s in
0.06s
1975 "\n",
1976 "2022-04-20 20:00:00 (19.2 MB/s) - 'glimmer-3.02-3.tar.bz2 saved
[1253634/1253634]\n",
1977 "\n",
1978 "info/hash_input.json\n",
1979 "info/index.json\n",
1980 "info/files\n",
1981 "info/about.json\n",
1982 "info/paths.json\n",
1983 "info/LICENSE.txt\n",
1984 "info/git\n",
1985 "info/test/run_test.sh\n",
1986 "info/recipe/build.sh\n",
1987 "info/recipe/meta.yaml.template\n",
1988 "bin/get-motif-counts.awk\n",
1989 "info/recipe/meta.yaml\n",
1990 "bin/match-list-col.awk\n",
1991 "bin/not-acgt.awk\n",
1992 "bin/upstream-coords.awk\n",
1993 "bin/g3-from-scratch.csh\n",
1994 "bin/g3-from-training.csh\n",
1995 "bin/glim-diff.awk\n",
1996 "info/recipe/conda_build_config.yaml\n",
1997 "bin/g3-iterated.csh\n",
1998 "bin/test\n",
1999 "bin/window-acgt\n",
2000 "bin/uncovered\n",
2001 "bin/entropy-profile\n",
2002 "bin/extract\n",
2003 "bin/entropy-score\n",
2004 "bin/anomaly\n",

```



```

2005 "bin/start-codon-distrib\n",
2006 "bin/multi-extract\n",
2007 "bin/score-fixed\n",
2008 "bin/build-icm\n",
2009 "bin/build-fixed\n",
2010 "bin/long-orfs\n",
2011 "bin/glimmer3\n",
2012 "Starting at Wed Apr 20 20:00:01 2022\n",
2013 "\n",
2014 "USAGE: glimmer3 [options] <sequence-file> <icm-file> <tag>\n",
2015 "\n",
2016 "Read DNA sequences in <sequence-file> and predict genes\n",
2017 "in them using the Interpolated Context Model in <icm-file>.\n",
2018 "Output details go to file <tag>.detail and predictions go to\n",
2019 "file <tag>.predict\n",
2020 "\n",
2021 "Options:\n",
2022 " -A <codon-list>\n",
2023 " --start_codons <codon-list>\n",
2024 "     Use comma-separated list of codons as start codons\n",
2025 "     Sample format: -A atg,gtg\n",
2026 "     Use -P option to specify relative proportions of use.\n",
2027 "     If -P not used, then proportions will be equal\n",
2028 " -b <filename>\n",
2029 " --rbs_pwm <filename>\n",
2030 "     Read a position weight matrix (PWM) from <filename> to identify\n",
2031 "     the ribosome binding site to help choose start sites\n",
2032 " -C <p>\n",
2033 " --gc_percent <p>\n",
2034 "     Use <p> as GC percentage of independent model\n",
2035 "     Note: <p> should be a percentage, e.g., -C 45.2\n",
2036 " -E <filename>\n",
2037 " --entropy <filename>\n",
2038 "     Read entropy profiles from <filename>. Format is one header\n",
2039 "     line, then 20 lines of 3 columns each. Columns are amino acid,\n",
2040 "     positive entropy, negative entropy. Rows must be in order\n",
2041 "     by amino acid code letter\n",
2042 " -f\n",
2043 " --first_codon\n",
2044 "     Use first codon in orf as start codon\n",
2045 " -g <n>\n",
2046 " --gene_len <n>\n",
2047 "     Set minimum gene length to <n>\n",
2048 " -h\n",
2049 " --help\n",
2050 "     Print this message\n",
2051 " -i <filename>\n",
2052 " --ignore <filename>\n",
2053 "     <filename> specifies regions of bases that are off\n",
2054 "     limits, so that no bases within that area will be examined\n",
2055 " -l\n",
2056 " --linear\n",
2057 "     Assume linear rather than circular genome, i.e., no wraparound\n",
2058 " -L <filename>\n",
2059 " --orf_coords <filename>\n",
2060 "     Use <filename> to specify a list of orfs that should\n",
2061 "     be scored separately, with no overlap rules\n",
2062 " -M\n",
2063 " --separate_genes\n",
2064 "     <sequence-file> is a multifasta file of separate genes to\n",
2065 "     be scored separately, with no overlap rules\n",
2066 " -o <n>\n",

```

```

2067         " --max_olap <n>\n",
2068         "     Set maximum overlap length to <n>. Overlaps this short or shorter\n"
2069     ,
2070         "     are ignored.\n",
2071         " -P <number-list>\n",
2072         " --start_probs <number-list>\n",
2073         "     Specify probability of different start codons (same number & order\n"
2074     ,
2075         "     as in -A option). If no -A option, then 3 values for atg, gtg and
2076     ttg\n",
2077         "     in that order. Sample format: -P 0.6,0.35,0.05\n",
2078         "     If -A is specified without -P, then starts are equally likely.\n",
2079         " -q <n>\n",
2080         " --ignore_score_len <n>\n",
2081         "     Do not use the initial score filter on any gene <n> or more\n",
2082         "     base long\n",
2083         " -r\n",
2084         " --no_indep\n",
2085         "     Don't use independent probability score column\n",
2086         " -t <n>\n",
2087         " --threshold <n>\n",
2088         "     Set threshold score for calling as gene to n. If the in-frame\n",
2089         "     score >= <n>, then the region is given a number and considered\n",
2090         "     a potential gene.\n",
2091         " -X\n",
2092         " --extend\n",
2093         "     Allow orfs extending off ends of sequence to be scored\n",
2094         " -z <n>\n",
2095         " --trans_table <n>\n",
2096         "     Use Genbank translation table number <n> for stop codons\n",
2097         " -Z <codon-list>\n",
2098         " --stop_codons <codon-list>\n",
2099         "     Use comma-separated list of codons as stop codons\n",
2100         "     Sample format: -Z tag,tga,taa\n",
2101         "\n"
2102     ]
2103 }
2104 ],
2105 {
2106     "cell_type": "code",
2107     "source": [
2108         "#install SRA toolkit\n",
2109         "!conda install -c bioconda sra-tools"
2110     ],
2111     "metadata": {
2112         "colab": {
2113             "base_uri": "https://localhost:8080/"
2114         },
2115         "id": "e-sE03EtjDzN",
2116         "outputId": "930c4c0b-f11f-4cc1-971a-d29e3f63279e"
2117     },
2118     "execution_count": 12,
2119     "outputs": [
2120         {
2121             "output_type": "stream",
2122             "name": "stdout",
2123             "text": [
2124                 "Collecting package metadata (current_repodata.json): - \b\b\\ \b\b| \b\b/
\b\b- \b\b\b\\ \b\b| \b\b/ \b\b- \b\b\b\\ \b\b| \b\b/ \b\bdone\n",
2125                 "Solving environment: \\ \b\b| \b\b/ \b\b- \b\bdone\n",
2126                 "\n",

```



```

2183     "outputs": [
2184     {
2185         "output_type": "stream",
2186         "name": "stdout",
2187         "text": [
2188             "--2022-04-20 20:00:57-- https://trace.ncbi.nlm.nih.gov/Traces/sra/?run=
SRR15312890\n",
2189             "Resolving trace.ncbi.nlm.nih.gov (trace.ncbi.nlm.nih.gov)...
130.14.29.113, 2607:f220:41e:4290::113\n",
2190             "Connecting to trace.ncbi.nlm.nih.gov (trace.ncbi.nlm.nih.gov)
|130.14.29.113|:443... connected.\n",
2191             "HTTP request sent, awaiting response... 200 OK\n",
2192             "Length: unspecified [text/html]\n",
2193             "Saving to: 'index.html?run='SRR15312890\n",
2194             "\n",
2195             "index.html?run=SRR1      [ <=>      ] 89.21K   331KB/s   in
0.3s
\n",
2196             "\n",
2197             "2022-04-20 20:00:57 (331 KB/s) - 'index.html?run='SRR15312890 saved
[91347]\n",
2198             "\n"
2199         ]
2200     }
2201 ]
2202 },
2203 {
2204     "cell_type": "code",
2205     "source": [
2206         "#download SRA data\n",
2207         "!wget https://sra-download.ncbi.nlm.nih.gov/traces/sra39/SRR/014953/
SRR15312890"
2208     ],
2209     "metadata": {
2210         "colab": {
2211             "base_uri": "https://localhost:8080/"
2212         },
2213         "id": "WFB72EXgjD21",
2214         "outputId": "1f3a35b7-29db-4f4f-b50c-40ee0c955384"
2215     },
2216     "execution_count": 14,
2217     "outputs": [
2218     {
2219         "output_type": "stream",
2220         "name": "stdout",
2221         "text": [
2222             "--2022-04-20 20:01:01-- https://sra-download.ncbi.nlm.nih.gov/traces/
sra39/SRR/014953/SRR15312890\n",
2223             "Resolving sra-download.ncbi.nlm.nih.gov (sra-download.ncbi.nlm.nih.gov)
... 165.112.9.235, 130.14.250.24, 130.14.250.25\n",
2224             "Connecting to sra-download.ncbi.nlm.nih.gov (sra-download.ncbi.nlm.nih.
gov)|165.112.9.235|:443... connected.\n",
2225             "HTTP request sent, awaiting response... 200 OK\n",
2226             "Length: 1691717943 (1.6G) [application/octet-stream]\n",
2227             "Saving to: 'SRR15312890\n",
2228             "\n",
2229             "SRR15312890      100%[=====>] 1.58G  15.9MB/s   in 29
s
\n",
2230             "\n",
2231             "2022-04-20 20:01:29 (56.5 MB/s) - 'SRR15312890 saved
[1691717943/1691717943]\n",
2232             "\n"
2233         ]

```



```

2294         "base_uri": "https://localhost:8080/"
2295     },
2296     "id": "GPxyCMR3jD88",
2297     "outputId": "0cf8555c-deec-4bf2-9374-2935f1874d01"
2298 },
2299 "execution_count": 18,
2300 "outputs": [
2301     {
2302         "output_type": "stream",
2303         "name": "stdout",
2304         "text": [
2305             "megahit: Output directory /root/assembly already exists, please change
the parameter -o to another value to avoid overwriting.\n"
2306         ]
2307     }
2308 ]
2309 },
2310 {
2311     "cell_type": "code",
2312     "source": [
2313         ""
2314     ],
2315     "metadata": {
2316         "id": "M-9Wo7tgjD-5"
2317     },
2318     "execution_count": null,
2319     "outputs": []
2320 },
2321 {
2322     "cell_type": "code",
2323     "source": [
2324         ""
2325     ],
2326     "metadata": {
2327         "id": "d8RnTmVijEA6"
2328     },
2329     "execution_count": null,
2330     "outputs": []
2331 },
2332 {
2333     "cell_type": "code",
2334     "source": [
2335         ""
2336     ],
2337     "metadata": {
2338         "id": "qEKt3hqmjECx"
2339     },
2340     "execution_count": null,
2341     "outputs": []
2342 },
2343 {
2344     "cell_type": "code",
2345     "source": [
2346         ""
2347     ],
2348     "metadata": {
2349         "id": "lIn-4AM5jEEt"
2350     },
2351     "execution_count": null,
2352     "outputs": []
2353 },
2354 {

```

```

2355     "cell_type": "code",
2356     "source": [
2357         ""
2358     ],
2359     "metadata": {
2360         "id": "aKRgreSHjEGs"
2361     },
2362     "execution_count": null,
2363     "outputs": []
2364 },
2365 {
2366     "cell_type": "code",
2367     "source": [
2368         ""
2369     ],
2370     "metadata": {
2371         "id": "xLjEp_FTjEIr"
2372     },
2373     "execution_count": null,
2374     "outputs": []
2375 },
2376 {
2377     "cell_type": "code",
2378     "source": [
2379         ""
2380     ],
2381     "metadata": {
2382         "id": "VWwea2gCjEKu"
2383     },
2384     "execution_count": null,
2385     "outputs": []
2386 },
2387 {
2388     "cell_type": "code",
2389     "source": [
2390         ""
2391     ],
2392     "metadata": {
2393         "id": "aqkFEXRTjEMc"
2394     },
2395     "execution_count": null,
2396     "outputs": []
2397 },
2398 {
2399     "cell_type": "code",
2400     "source": [
2401         ""
2402     ],
2403     "metadata": {
2404         "id": "c3AFEDwHjEOG"
2405     },
2406     "execution_count": null,
2407     "outputs": []
2408 },
2409 {
2410     "cell_type": "code",
2411     "source": [
2412         ""
2413     ],
2414     "metadata": {
2415         "id": "tNBS6zqLjEQH"
2416     },

```

```
2417     "execution_count": null,  
2418     "outputs": []  
2419   }  
2420 ]  
2421 }
```

R code files are included in the zip folder, as R files couldn't be imported to this latex file.
Kindly refer to the attached documents for the R files.