Music Genre I

Benjamin Lee
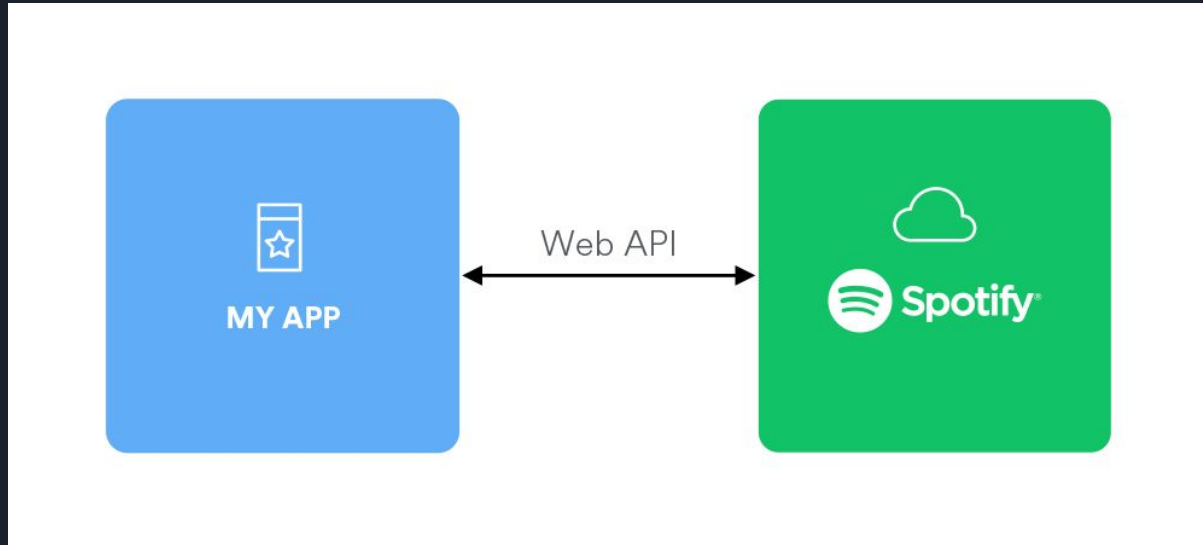Justin Gelabert
Juan Echevarria

Motivation

- We naturally classify music genres to put like-songs in groups
- Make an AI to classify songs for us
- Could be used to push recommended songs based on a song's genre
- Application opportunity towards organization of music

Project Description

- Multi-class classifier
- Predicts song genre based on the Spotify song attributes using information gathered from the Spotify API

Data Sets

	title	artist	top genre	year	bpm	nrgy	dnce	dB	live	val	dur	acous	spch	pop
1	Hey, Soul Sister	Train	neo mellow	2010	97	89	67	-4	8	80	217	19	4	83
2	Love The Way You Lie	Eminem	detroit hip hop	2010	87	93	75	-5	52	64	263	24	23	82
3	TiK ToK	Kesha	dance pop	2010	120	84	76	-3	29	71	200	10	14	80
4	Bad Romance	Lady Gaga	dance pop	2010	119	92	70	-4	8	71	295	0	4	79
5	Just the Way You Are	Bruno Mars	pop	2010	109	84	64	-5	9	43	221	2	4	78
6	Baby	Justin Bieber	canadian pop	2010	65	86	73	-5	11	54	214	4	14	77
7	Dynamite	Taio Cruz	dance pop	2010	120	78	75	-4	4	82	203	0	9	77
8	Secrets	OneRepublic	dance pop	2010	148	76	52	-6	12	38	225	7	4	77
9	Empire State of Mind (Part II) Broken Down	Alicia Keys	hip pop	2010	93	37	48	-8	12	14	216	74	3	76
10	Only Girl (In The World)	Rihanna	barbadian pop	2010	126	72	79	-4	7	61	235	13	4	73
11	Club Can't Handle Me (feat. David Guetta)	Flo Rida	dance pop	2010	128	87	62	-4	6	47	235	3	3	73
12	Marry You	Bruno Mars	pop	2010	145	83	62	-5	10	48	230	33	4	73
13	Cooler Than Me - Single Mix	Mike Posner	dance pop	2010	130	82	77	-5	70	63	213	18	5	73
14	Telephone	Lady Gaga	dance pop	2010	122	83	83	-6	11	71	221	1	4	73
15	Like A G6	Far East Movement	dance pop	2010	125	84	44	-8	12	78	217	1	45	72
16	OMG (feat. will.i.am)	Usher	atl hip hop	2010	130	75	78	-6	36	33	269	20	3	72
17	Eenie Meenie	Sean Kingston	dance pop	2010	121	61	72	-4	11	83	202	5	3	71
18	The Time (Dirty Bit)	The Black Eyed Peas	dance pop	2010	128	81	82	-8	60	44	308	7	7	70
19	Alejandro	Lady Gaga	dance pop	2010	99	80	63	-7	36	37	274	0	5	69
20	Your Love Is My Drug	Kesha	dance pop	2010	120	61	83	-4	9	76	187	1	10	69
21	Meet Me Halfway	The Black Eyed Peas	dance pop	2010	130	63	80	-7	32	40	284	0	7	68
22	Whataya Want from Me	Adam Lambert	australian pop	2010	186	68	44	-5	6	45	227	1	5	66
23	Take It Off	Kesha	dance pop	2010	125	68	73	-5	9	74	215	0	3	66
24	Misery	Maroon 5	pop	2010	103	81	70	-5	22	73	216	0	4	65
25	All The Right Moves	OneRepublic	dance pop	2010	146	95	53	-4	28	65	238	26	5	65
26	Animal	Neon Trees	indie pop	2010	148	83	48	-6	38	74	212	0	4	65
27	Naturally	Selena Gomez & The Scene	dance pop	2010	133	90	61	-5	5	88	203	2	5	64
28	I Like It	Enrique Iglesias	dance pop	2010	129	94	65	-3	6	73	231	2	9	63
29	Teenage Dream	Katy Perry	dance pop	2010	120	80	72	-5	13	59	228	2	4	63
30	California Gurls	Katy Perry	dance pop	2010	125	75	79	-4	18	40	235	0	5	62
31		3 Britney Spears	dance pop	2010	135	71	70	-2	14	79	213	5	5	62
32	My First Kiss - feat. Ke$ha	3OH!3	dance pop	2010	138	89	68	-4	36	83	192	1	8	62
33	Blah Blah Blah (feat. 3OH!3)	Kesha	dance pop	2010	120	84	75	-3	42	52	172	8	12	62
34	Imma Be	The Black Eyed Peas	dance pop	2010	92	52	60	-7	31	41	258	18	37	62
35	Try Sleeping with a Broken Heart	Alicia Keys	hip pop	2010	111	82	50	-5	13	55	249	16	11	62
36	Sexy Bitch (feat. Akon)	David Guetta	dance pop	2010	130	63	81	-5	13	80	196	8	5	61
37	Bound To You - Burlesque Original Motion Picture Soundtrack	Christina Aguilera	dance pop	2010	164	41	29	-5	13	7	264	83	3	61

Problems Encountered

- First dataset used was biased towards pop music
  - AI ended up predicting mostly pop genres
- Scraped Spotify using Spotipy library to build an evenly distributed dataset
  - Spotify Audio Features do not include genre
  - Used Every Noise playlists for 10 different genres to build an unbiased dataset
    - Took audio features for the top 100 songs in each playlist
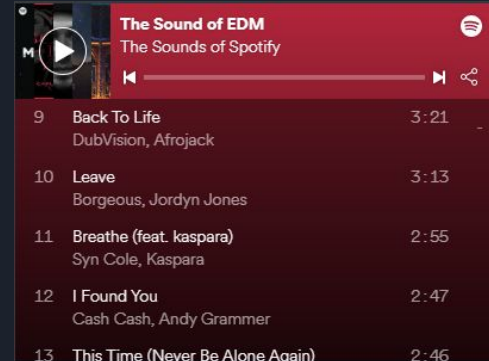   - Classical, country, jazz, metal, rock, rap, lo-fi, edm, pop, and r&b

Audio Features of a track

Get audio feature information about one or several tracks.

Audio features available

Acousticness	Mode
Danceability	Speechiness
Energy	Tempo
Instrumentalness	Time Signature
Key	Valence
Liveness	
Loudness	

```python
music_id_list = []
track_details = []

for item in playlist['tracks']['items']:
    music_id_list.append(item['track']['id'])

def get_features(meta): # meta = music_id_list[] - AKA track_id
    meta_t = sp.track(meta) # track information
    meta_af = sp.audio_features(meta) # audio_features
    metadata= {'genre': genre, 'name': meta_t['name'],
               'danceability': meta_af[0]['danceability'],
               'energy': meta_af[0]['energy'], 'loudness': meta_af[0]['loudness'],
               'speechiness': meta_af[0]['speechiness'],'acousticness': meta_af[0]['acousticness'],
               'instrumentalness': meta_af[0]['instrumentalness'],'liveness': meta_af[0]['liveness'],
               'valence':meta_af[0]['valence'], 'key': meta_af[0]['key'],
               'tempo': meta_af[0]['tempo']}
    return metadata
```

The Sound of EDM
The Sounds of Spotify

9	Back To Life	3:21
	DubVision, Afrojack	
10	Leave	3:13
	Borgeous, Jordyn Jones	
11	Breathe (feat. kaspara)	2:55
	Syn Cole, Kaspara	
12	I Found You	2:47
	Cash Cash, Andy Grammer	
13	This Time (Never Be Alone Again)	2:46

Data Description

- 10 features: acousticness, liveness, speechiness, instrumentalness, loudness, danceability, energy, valence, tempo, key
- 1000 samples: 100 songs per genre

	genre	name	artist	danceabil	energy	loudness	speechine	acousticn	instrumer	liveness	valence	key	tempo
0	classical	Handel / Orch. Hale: Keyboard Suite in D Minor, HWV 437: III. Sarabande	George Frideric Handel	0.0939	0.0336	-24.041	0.0606	0.927	0.83	0.0954	0.0516	2	67.359
1	classical	Goldberg Variations, BWV 988: Aria	Johann Sebastian Bach	0.454	0.0139	-29.966	0.0514	0.995	0.943	0.0736	0.244	4	130.253
2	classical	Clair de Lune, L. 32	Claude Debussy	0.335	0.00532	-31.646	0.0376	0.994	0.912	0.0621	0.0397	1	65.832
3	classical	Sonata No. 14 "Moonlight" in C-Sharp Minor, Op. 27 No. 2: I. Adagio sostenuto	Ludwig van Beethoven	0.184	0.00527	-37.264	0.0432	0.995	0.887	0.173	0.151	1	170.612
4	classical	Miroirs: III. Une barque sur l'ocÃ©an	Maurice Ravel	0.17	0.0479	-27.021	0.0438	0.981	0.906	0.0795	0.0304	2	75.664
5	classical	Nocturne No.2 In E Flat, Op.9 No.2	FrÃ©dÃ©ric Chopin	0.442	0.00919	-32.452	0.047	0.984	0.936	0.0873	0.0929	3	79.314
6	classical	Cello Concerto No. 1 in C Major, Hob. VIIb:1: II. Adagio	Franz Joseph Haydn	0.0859	0.0653	-24.541	0.0572	0.972	0.889	0.0876	0.068	5	61.538
7	classical	Lyric Pieces, Book 5, Op. 54: Nocturne	Edvard Grieg	0.296	0.0435	-29.73	0.0411	0.987	0.857	0.0786	0.0302	0	72.282
8	classical	Piano Concerto No. 21 in C Major, K. 467 "Elvira Madigan": II. Andante	Wolfgang Amadeus Mozart	0.194	0.0324	-28.215	0.0382	0.982	0.961	0.0916	0.0596	5	144.13
9	classical	8 Humoresques, Op. 101, B. 187: No. 7, Poco lento e grazioso (Transcribed by Oscar Morawetz for Violin, Cello & Orchestra)	AntonÃn DvoÅ™Ã¡k	0.182	0.0603	-25.046	0.0459	0.852	0.411	0.145	0.141	6	98.799
10	classical	Sechs KlavierstÃ¼cke, Op. 118: II. Intermezzo in A Major	Johannes Brahms	0.299	0.00626	-30.923	0.0478	0.994	0.901	0.0823	0.0634	9	69.043
11	classical	The Four Seasons - Violin Concerto in F Minor, Op. 8 No. 4, RV 297 "Winter": I. Allegro non molto	Antonio Vivaldi	0.48	0.183	-19.117	0.0645	0.81	0.754	0.093	0.212	5	158.366
12	classical	Nabucco / Act 3: Va, pensiero, sull'ali dorate	Giuseppe Verdi	0.0666	0.0211	-24.057	0.0398	0.984	0.685	0.0999	0.132	1	73.377
13	classical	Die Walküre, Act III: Ride of the Valkyries	Richard Wagner	0.251	0.219	-16.781	0.0323	0.929	0.933	0.0824	0.0965	7	89.997
14	classical	6 Impromptus, Op. 5: Impromptu VI	Jean Sibelius	0.448	0.0052	-36.512	0.0564	0.995	0.88	0.0698	0.0398	4	62.171
15	classical	Pini di Roma (The Pines of Rome): III. I pini del Gianicolo	Ottorino Respighi	0.0754	0.0102	-35.69	0.0464	0.901	0.106	0.0817	0.0331	4	81.324
16	classical	Violin Sonata in A major, FWV 8: IV. Allegretto poco mosso	CÃ©sar Franck	0.25	0.135	-18.615	0.0488	0.958	0.0349	0.0477	0.179	5	94.404
17	classical	Gianni Schicchi: "O mio Babbino caro"	Giacomo Puccini	0.112	0.196	-14.767	0.0418	0.966	0.802	0.117	0.0363	8	89.321
18	classical	An der schÃ¶nen blauen Donau, Op.314	Johann Strauss II	0.233	0.0252	-24.824	0.0346	0.975	0.601	0.143	0.0936	2	94.736
19	classical	Minuet in A Major, D. 334	Franz Schubert	0.273	0.0573	-39.245	0.0493	0.994	0.913	0.0857	0.174	9	91.621
20	classical	4 Lieder, Op. 27, TrV 170: IV. Morgen! (Arr. for Cello and Piano by Julian Riem)	Richard Strauss	0.138	0.0126	-28.316	0.0521	0.992	0.787	0.0713	0.0343	5	174.084
21	classical	Symphony No. 4 in E-Flat Major, WAB 104, "Romantic": I. Bewegt, nicht zu schnell - Live	Anton Bruckner	0.0724	0.0659	-19.545	0.0408	0.947	0.866	0.109	0.0366	3	70.285
22	classical	Lieder ohne Worte (Songs without Words), Book 2, Op. 30: No. 7 in E-Flat Major, Op. 30, No. 1	Felix Mendelssohn	0.355	0.0164	-28.659	0.0396	0.995	0.926	0.0986	0.0922	3	67.946
23	classical	Symphonie fantastique, Op. 14: Symphonie fantastique, Op. 14: IV. Marche au supplice	Hector Berlioz	0.356	0.207	-17.76	0.0388	0.95	0.914	0.0802	0.328	10	146.755
24	classical	The Lark Ascending	Ralph Vaughan Williams	0.0811	0.0122	-32.654	0.0511	0.902	0.308	0.0648	0.0384	4	74.554
25	classical	The Planets, Op. 32: IV. Jupiter, the Bringer of Jollity	Gustav Holst	0.29	0.13	-21.544	0.0386	0.943	0.911	0.0811	0.154	7	132.869
26	classical	Violin Concerto No.1 in G minor, Op.26: 1. Vorspiel (Allegro moderato)	Max Bruch	0.169	0.0974	-21.414	0.042	0.864	0.632	0.087	0.0524	3	170.379
27	classical	Liebestraume, S541/R211 : No. 3: Nocturne in A-Flat Major	Franz Liszt	0.343	0.0342	-25.591	0.0406	0.991	0.92	0.1	0.0378	8	60.228
28	classical	3 Small Tone Poems: No. 1. Summer Evening	Frederick Delius	0.102	0.0449	-23.95	0.0388	0.972	0.771	0.0646	0.0334	2	90.459
29	classical	Carnival of the Animals, R. 125: The Swan	Camille Saint-SaÃ«ns	0.211	0.00756	-33.123	0.0455	0.994	0.89	0.0734	0.0911	7	118.247
30	classical	FaurÃ©: Pavane in F-Sharp Minor, Op. 50	Gabriel FaurÃ©	0.0982	0.0575	-24.448	0.0454	0.984	0.904	0.122	0.0392	6	70.041
31	classical	Khachaturian: Spartacus (Highlights from the Ballet): Adagio of Spartacus and Phrygia	Aram Khachaturian	0.109	0.106	-21.253	0.0392	0.82	0.816	0.102	0.0334	8	88.285
32	classical	Cello Concerto in E Minor, Op.85 (1997 - Remaster): I. Adagio - Moderato	Edward Elgar	0.124	0.0978	-22.849	0.0432	0.552	0.218	0.112	0.0433	4	96.309
33	classical	Adagio in G Minor	Tomaso Albinoni	0.099	0.279	-12.939	0.0346	0.743	0.903	0.114	0.0464	7	89.755
34	classical	GymnopÃ©die No. 1	Erik Satie	0.469	0.0128	-36.856	0.119	0.994	0.937	0.0941	0.354	7	72.765
35	classical	Die Moldau	BedÅ™ich Smetana	0.253	0.224	-12.908	0.0321	0.937	0.88	0.116	0.107	7	76.652
36	classical	Barber: Adagio for Strings	Samuel Barber	0.102	0.0733	-24.133	0.0488	0.974	0.859	0.0868	0.0328	10	73.954
37	classical	Barcarolle	Jacques Offenbach	0.238	0.0815	-22.5	0.045	0.983	4.01E-05	0.279	0.0414	2	128.52
38	classical	Mahler: Symphony No. 5 in C-Sharp Minor: IV. Adagietto	Gustav Mahler	0.0783	0.0523	-23.247	0.0471	0.896	0.945	0.0806	0.0327	5	82.015
39	classical	Cello Concerto in C Major, G. 477: II. Largo	Luigi Boccherini	0.0959	0.00714	-36.544	0.0427	0.92	0.0281	0.106	0.0532	5	70.474
40	classical	Overture Candide	Leonard Bernstein	0.285	0.428	-11.916	0.0436	0.852	0.506	0.114	0.48	3	159.082
41	classical	Kinderszenen, Op. 15: No. 7 in F Major, TrÃ¤umerei	Robert Schumann	0.5	0.0123	-30.17	0.0712	0.995	0.954	0.0748	0.313	5	130.128
42	classical	Dido and Aeneas, Z. 626 / Act 3: "When I Am Laid In Earth" Dido's Lamento (Arr. For Cello And Strings By Mathieu Herzog)	Henry Purcell	0.0752	0.0604	-23.96	0.0485	0.957	0.902	0.0889	0.034	7	76.509
43	classical	Jazz Suite No. 2: VI. Waltz 2	Dmitri Shostakovich	0.322	0.184	-18.312	0.0338	0.964	0.902	0.0813	0.356	0	107.847
44	classical	6 Violin Sonatas, Op. 10b No. 2 in G Major, J. 100: II. Adagio	Carl Maria von Weber	0.0808	0.00344	-38.037	0.0458	0.972	0.112	0.141	0.197	0	81.353
45	classical	Carmen, Act I: No.5 Habanera : L'amour est un oiseau rebelle (Carmen/CigarÃ¨res/Jeunes gens/Dragons)	Georges Bizet	0.364	0.0592	-21.757	0.057	0.78	0	0.0823	0.185	2	123.789
46	classical	Mascagni: Cavalleria rusticana: Intermezzo	Pietro Mascagni	0.101	0.115	-17.553	0.0392	0.769	0.891	0.406	0.0374	5	84.976
47	classical	Delibes: LakmÃ©, Act I: "DÃ´me Ã©pais, le jasmin" (LakmÃ©, Mallika)	LÃ©o Delibes	0.291	0.119	-20.493	0.0439	0.972	0.51	0.296	0.0571	11	125.103
48	classical	Rodrigo: Concierto de Aranjuez: II. Adagio	JoaquÃn Rodrigo	0.253	0.098	-19.878	0.0437	0.93	0.862	0.122	0.062	11	84.865
49	classical	Weint nicht um meinen Tod	Johann Bach	0.204	0.0367	-25.506	0.0577	0.948	0.12	0.118	0.097	0	74.222
50	classical	Das Verlassene MÃ¤gdlein	Hugo Wolf	0.295	0.0044	-33.891	0.049	0.991	0.0826	0.0974	0.0354	9	69.553

Preprocessing

- Remove qualitative columns (name, artist)
- MinMaxScaler
  - sklearn.preprocessing.MinMaxScaler
  - Set the range from -1 to 1 for each value

	genre	name	artist	danceability	energy	loudness	speechiness	acousticness	instrumentalness	liveness	valence	key	tempo
0		VIBEZ	DaBaby	0.768	0.652	-2.708	0.307	0.113	0	0.107	0.777	1	154.187

	0	1	2	3	4	5	6	7	8	9
0	0.552801	0.302598	0.930952	0.564018	-0.773094	-1.0	-0.831965	0.573139	-0.818182	0.355594

Experimental Settings

- What machine learning methods did you consider for benchmark? How do you tune the optimal parameter?
  - K-Fold Cross Validation so it trained on the test data for each experiment
- What are evaluation strategies (e.g., k-fold cross validation) for the performance comparison?
  - K-Fold Cross Validation with random subsampling
    - Datasets were balanced since 100 songs for each of the 10 genres
- How many times are the experiments repeated?
  - 10 times for 10 folds

Project Implementation

- Support Vector Machines (SVM)
  - sklearn.svm.SVC
  - Kernel Functions
    - Linear
    - Poly
    - RBF
- K-Nearest Neighbors (KNN)
  - sklearn.neighbors.KNeighborsClassifier
  - 10 neighbors
- Logistic Regression
  - sklearn.linear_model.LogisticRegression
  - Solver
    - sag - Stochastic Average Gradient descent solver
- Neural Network
  - sklearn.neural_network.MLPClassifier
    - Multi-layer Perceptron classifier
  - Activation Function
    - ReLU
  - Solver
    - adam - stochastic gradient-based optimizer

Linear Kernel SVM
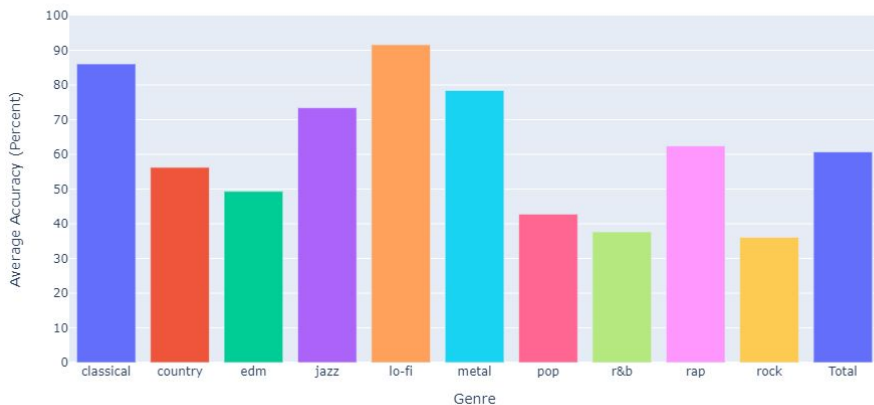
- Total Average Accuracy = 61.5%
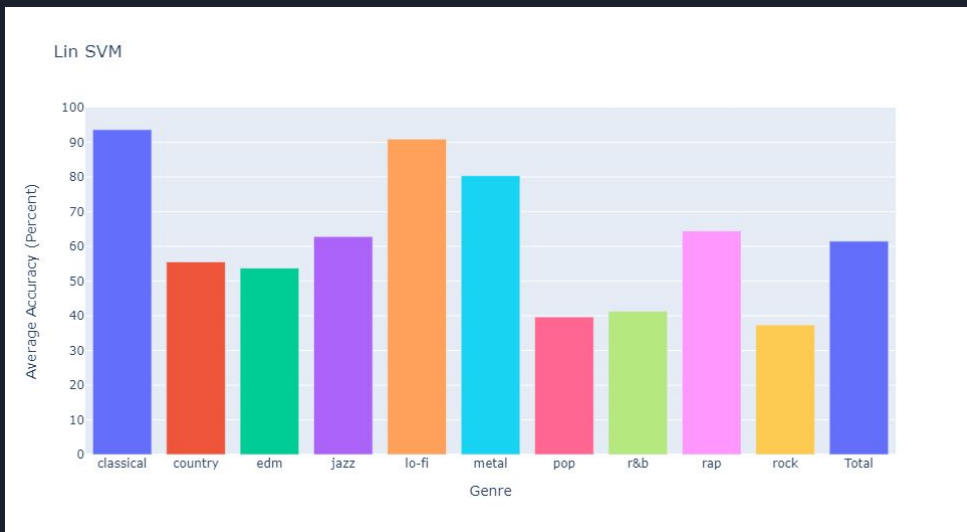
	classical	country	edm	jazz	lo-fi	metal	pop	r&b	rap	rock	Total
0	1.000000	0.714286	0.416667	0.571429	1.000000	0.875000	0.333333	0.444444	0.571429	0.333333	0.620
1	0.833333	0.285714	0.684211	0.500000	1.000000	0.833333	0.285714	0.333333	0.538462	0.500000	0.610
2	0.846154	0.444444	0.333333	0.666667	0.818182	0.666667	0.388889	0.250000	0.750000	0.555556	0.580
3	0.900000	0.454545	0.416667	0.714286	0.909091	0.727273	0.666667	0.461538	0.666667	0.100000	0.590
4	1.000000	0.411765	0.714286	0.625000	1.000000	0.818182	0.600000	0.500000	0.538462	0.666667	0.670
5	1.000000	0.642857	0.800000	0.555556	1.000000	0.888889	0.222222	0.200000	0.500000	0.333333	0.610
6	1.000000	0.875000	0.444444	0.666667	0.833333	1.000000	0.312500	0.250000	0.600000	0.222222	0.600
7	1.000000	0.400000	0.250000	0.533333	0.866667	0.909091	0.250000	0.714286	0.625000	0.272727	0.590
8	0.928571	0.555556	0.600000	0.700000	0.833333	0.818182	0.600000	0.529412	0.777778	0.444444	0.680
9	0.857143	0.769231	0.714286	0.750000	0.833333	0.500000	0.307692	0.444444	0.875000	0.307692	0.600
Avg	0.936520	0.555340	0.537389	0.628294	0.909394	0.803662	0.396702	0.412746	0.644280	0.373598	0.615

Poly Kernel SVM

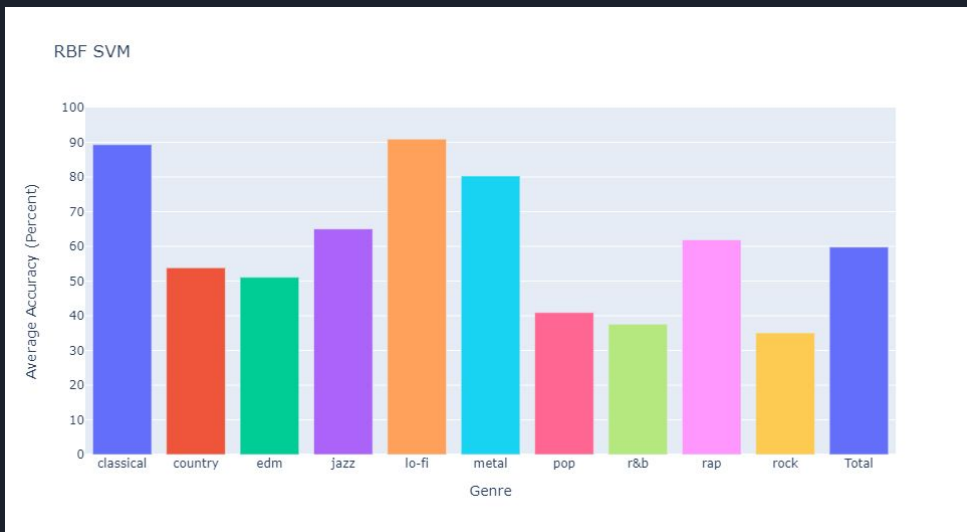- Total Average Accuracy = 60.7%

	classical	country	edm	jazz	lo-fi	metal	pop	r&b	rap	rock	Total
0	1.000000	0.714286	0.333333	0.857143	1.000000	0.875000	0.444444	0.222222	0.500000	0.333333	0.610
1	0.750000	0.285714	0.631579	0.500000	1.000000	0.833333	0.285714	0.444444	0.538462	0.500000	0.600
2	0.769231	0.555556	0.333333	0.583333	0.818182	0.666667	0.333333	0.375000	0.750000	0.222222	0.540
3	0.700000	0.363636	0.500000	1.000000	0.909091	0.727273	0.666667	0.384615	0.777778	0.300000	0.610
4	0.888889	0.352941	0.571429	0.625000	1.000000	0.818182	0.600000	0.300000	0.538462	0.666667	0.620
5	1.000000	0.642857	0.800000	0.777778	1.000000	0.777778	0.333333	0.200000	0.500000	0.416667	0.640
6	1.000000	0.875000	0.444444	0.833333	0.833333	1.000000	0.375000	0.375000	0.500000	0.333333	0.640
7	1.000000	0.400000	0.250000	0.533333	0.933333	0.909091	0.333333	0.714286	0.500000	0.272727	0.600
8	0.785714	0.666667	0.500000	0.800000	0.666667	0.818182	0.600000	0.529412	0.888889	0.333333	0.660
9	0.714286	0.769231	0.571429	0.833333	1.000000	0.416667	0.307692	0.222222	0.750000	0.230769	0.550
Avg	0.860812	0.562589	0.493555	0.734325	0.916061	0.784217	0.427952	0.376720	0.624359	0.360905	0.607

RBF Kernel SVM

- Total Average Accuracy = 59.8%

	classical	country	edm	jazz	lo-fi	metal	pop	r&b	rap	rock	Total
0	1.000000	0.714286	0.250000	0.714286	0.933333	0.875000	0.444444	0.333333	0.571429	0.333333	0.600
1	0.750000	0.285714	0.736842	0.375000	1.000000	0.833333	0.285714	0.333333	0.461538	0.500000	0.590
2	0.769231	0.555556	0.333333	0.500000	0.818182	0.666667	0.222222	0.250000	0.750000	0.444444	0.520
3	0.700000	0.454545	0.416667	0.857143	0.909091	0.727273	0.500000	0.461538	0.777778	0.400000	0.610
4	1.000000	0.294118	0.571429	0.750000	1.000000	0.727273	0.600000	0.400000	0.461538	0.666667	0.620
5	1.000000	0.571429	0.800000	0.555556	1.000000	0.888889	0.333333	0.200000	0.500000	0.416667	0.620
6	1.000000	0.750000	0.555556	0.666667	0.833333	1.000000	0.312500	0.375000	0.500000	0.111111	0.590
7	1.000000	0.400000	0.375000	0.533333	0.933333	0.909091	0.333333	0.714286	0.625000	0.181818	0.610
8	0.857143	0.666667	0.500000	0.800000	0.666667	0.818182	0.600000	0.470588	0.666667	0.222222	0.630
9	0.857143	0.692308	0.571429	0.750000	1.000000	0.583333	0.461538	0.222222	0.875000	0.230769	0.590
Avg	0.893352	0.538462	0.511025	0.650198	0.909394	0.802904	0.409309	0.376030	0.618895	0.350703	0.598

KNN

- Total Average Accuracy = 53.1%
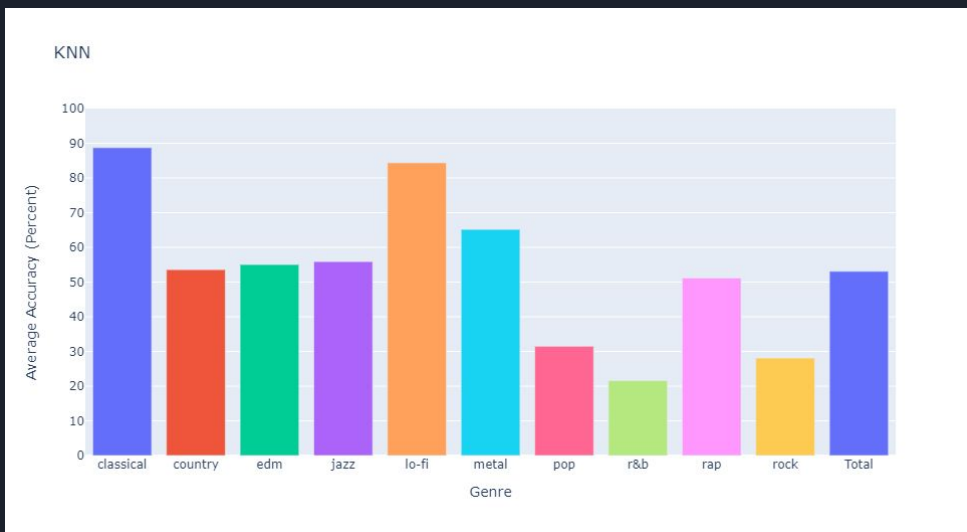
	classical	country	edm	jazz	lo-fi	metal	pop	r&b	rap	rock	Total
0	1.000000	0.428571	0.250000	0.714286	0.800000	0.875000	0.222222	0.222222	0.571429	0.250000	0.520
1	0.833333	0.428571	0.631579	0.375000	1.000000	0.833333	0.285714	0.111111	0.461538	0.500000	0.570
2	0.769231	0.555556	0.333333	0.416667	0.636364	0.333333	0.222222	0.375000	0.625000	0.444444	0.470
3	0.700000	0.363636	0.500000	0.857143	0.909091	0.545455	0.333333	0.153846	0.666667	0.300000	0.520
4	1.000000	0.647059	0.857143	0.500000	0.909091	0.545455	0.400000	0.200000	0.461538	0.333333	0.590
5	1.000000	0.642857	0.700000	0.444444	1.000000	0.555556	0.333333	0.400000	0.500000	0.250000	0.580
6	1.000000	0.500000	0.444444	0.500000	0.750000	0.777778	0.250000	0.125000	0.400000	0.111111	0.470
7	1.000000	0.400000	0.375000	0.400000	0.933333	0.909091	0.166667	0.285714	0.375000	0.090909	0.510
8	0.714286	0.777778	0.700000	0.800000	0.833333	0.727273	0.400000	0.176471	0.555556	0.222222	0.570
9	0.857143	0.615385	0.714286	0.583333	0.666667	0.416667	0.538462	0.111111	0.500000	0.307692	0.510
Avg	0.887399	0.535941	0.550579	0.559087	0.843788	0.651894	0.315195	0.216048	0.511673	0.280971	0.531

Logistic Regression

- Total Average Accuracy = 57.7%
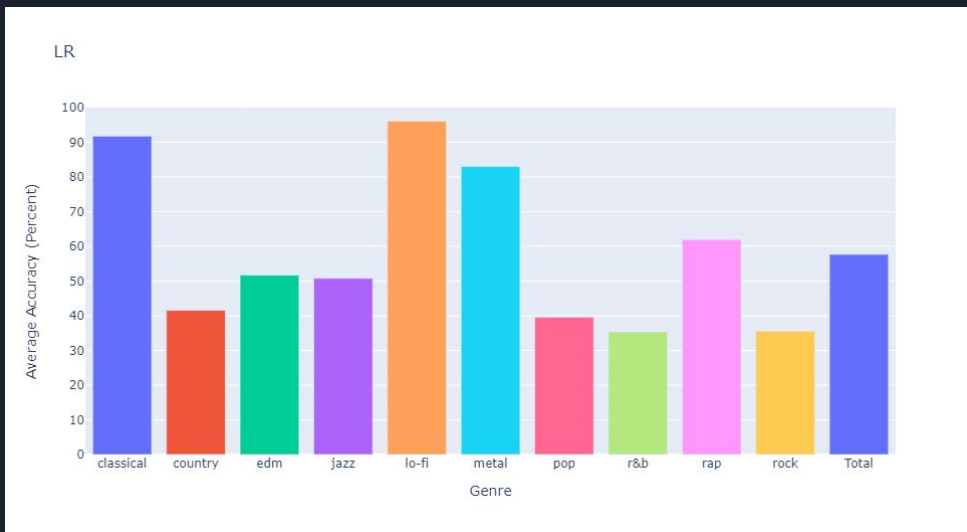
	classical	country	edm	jazz	lo-fi	metal	pop	r&b	rap	rock	Total
0	1.000000	0.571429	0.416667	0.571429	0.933333	0.875000	0.222222	0.111111	0.571429	0.416667	0.570
1	0.916667	0.142857	0.631579	0.250000	1.000000	0.833333	0.285714	0.222222	0.615385	0.500000	0.580
2	0.846154	0.555556	0.500000	0.416667	1.000000	0.666667	0.277778	0.500000	0.625000	0.111111	0.540
3	0.700000	0.454545	0.416667	0.714286	0.909091	0.818182	0.666667	0.384615	0.777778	0.400000	0.610
4	1.000000	0.235294	0.571429	0.500000	1.000000	0.818182	0.800000	0.400000	0.538462	0.555556	0.610
5	1.000000	0.500000	0.500000	0.444444	1.000000	0.888889	0.222222	0.200000	0.375000	0.250000	0.530
6	1.000000	0.625000	0.444444	0.500000	0.833333	1.000000	0.250000	0.375000	0.400000	0.111111	0.530
7	1.000000	0.200000	0.375000	0.400000	0.933333	0.909091	0.250000	0.714286	0.750000	0.272727	0.590
8	0.857143	0.333333	0.600000	0.700000	1.000000	0.909091	0.600000	0.294118	0.666667	0.555556	0.630
9	0.857143	0.538462	0.714286	0.583333	1.000000	0.583333	0.384615	0.333333	0.875000	0.384615	0.580
Avg	0.917711	0.415648	0.517007	0.508016	0.960909	0.830177	0.395922	0.353469	0.619472	0.355734	0.577

Neural Network

- Total Average Accuracy = 61.1%
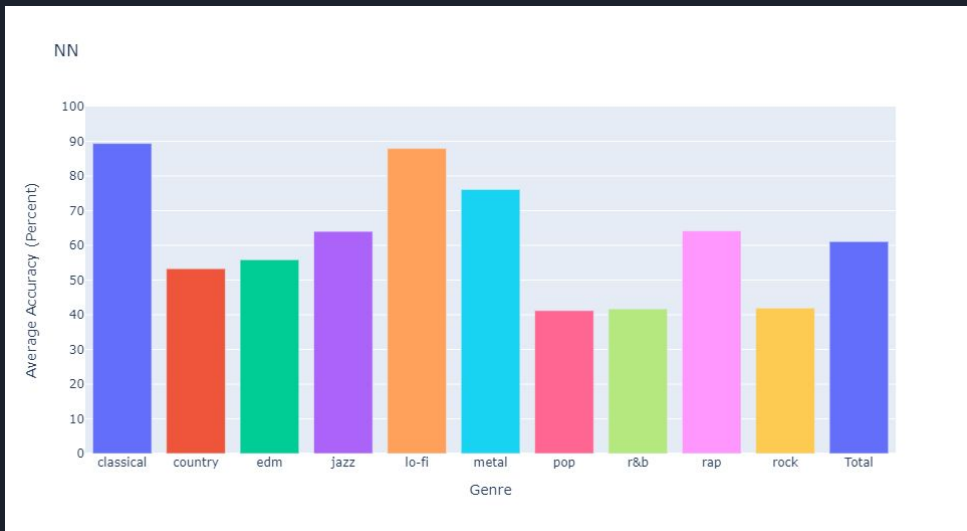
	classical	country	edm	jazz	lo-fi	metal	pop	r&b	rap	rock	Total
0	1.000000	0.571429	0.416667	0.571429	0.866667	0.625000	0.555556	0.333333	0.571429	0.333333	0.580
1	0.750000	0.428571	0.736842	0.500000	1.000000	0.750000	0.285714	0.222222	0.538462	0.500000	0.600
2	0.846154	0.444444	0.500000	0.750000	0.818182	0.666667	0.333333	0.375000	0.750000	0.444444	0.590
3	0.700000	0.454545	0.416667	0.857143	0.909091	0.727273	0.500000	0.384615	0.666667	0.300000	0.580
4	1.000000	0.411765	0.714286	0.625000	1.000000	0.818182	0.600000	0.400000	0.538462	0.777778	0.670
5	1.000000	0.714286	0.800000	0.666667	1.000000	0.888889	0.222222	0.300000	0.500000	0.333333	0.640
6	1.000000	0.625000	0.555556	0.666667	0.666667	1.000000	0.312500	0.375000	0.700000	0.222222	0.590
7	1.000000	0.200000	0.375000	0.400000	0.866667	0.909091	0.250000	0.857143	0.625000	0.454545	0.600
8	0.785714	0.555556	0.500000	0.700000	0.666667	0.727273	0.600000	0.588235	0.777778	0.444444	0.640
9	0.857143	0.923077	0.571429	0.666667	1.000000	0.500000	0.461538	0.333333	0.750000	0.384615	0.620
Avg	0.893901	0.532867	0.558645	0.640357	0.879394	0.761237	0.412086	0.416888	0.641780	0.419472	0.611

Totals

- Best Accuracy was using Linear SVM
- Similar accuracies across all models
  - Except KNN
- Classical, Lo-Fi, and metal were the easiest to classify
- Pop, R&B, and Rock were the hardest to classify

Lin SVM

Average Model Accuracies
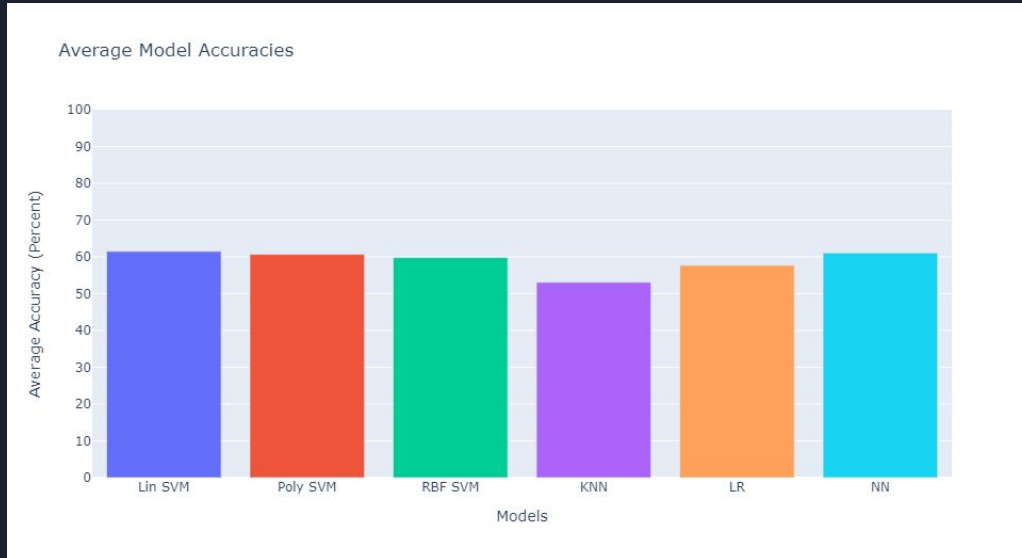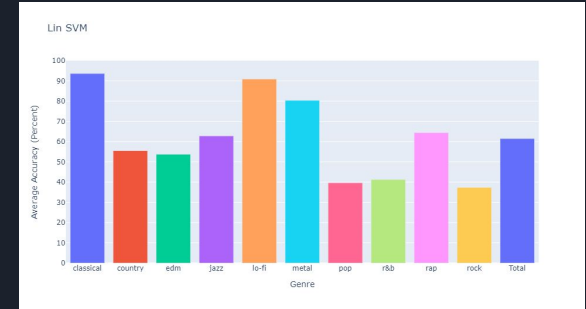
	Lin SVM	Poly SVM	RBF SVM	KNN	LR	NN
0	0.620	0.610	0.600	0.520	0.570	0.580
1	0.610	0.600	0.590	0.570	0.580	0.600
2	0.580	0.540	0.520	0.470	0.540	0.590
3	0.590	0.610	0.610	0.520	0.610	0.580
4	0.670	0.620	0.620	0.590	0.610	0.670
5	0.610	0.640	0.620	0.580	0.530	0.640
6	0.600	0.640	0.590	0.470	0.530	0.590
7	0.590	0.600	0.610	0.510	0.590	0.600
8	0.680	0.660	0.630	0.570	0.630	0.640
9	0.600	0.550	0.590	0.510	0.580	0.620
Avg	0.615	0.607	0.598	0.531	0.577	0.611

Demo

- Have a song to run through the models?