In [14]:
```
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns

from sklearn.model_selection import RepeatedKFold, cross_val_score
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
```

In [15]:
```
df = pd.read_csv('clean_dataset.csv', sep=',',index_col=0, header=0)
df.head()
```

Out[15]:

	Latitude	Longitude	Month	Hour	Humidity	AmbientTemp	PolyPwr	Wind.Speed	Visibility	Pre
0	47.11	-122.57	12	11	81.71997	12.86919	0.886940	5	10.0	
1	47.11	-122.57	12	13	96.64917	9.66415	0.901270	0	10.0	
2	47.11	-122.57	12	13	93.61572	15.44983	1.497021	5	10.0	
3	47.11	-122.57	12	12	77.21558	10.36659	0.502979	5	2.0	
4	47.11	-122.57	12	14	54.80347	16.85471	1.883942	3	3.0	

Input/Target Variable Split

In [16]:
```
X = df.drop(['PolyPwr'], axis=1)
X.shape
```

Out[16]:
```
(21045, 14)
```

In [17]:
```
y = df['PolyPwr']
y.shape
```

Out[17]:
```
(21045,)
```

Train/Test Split

In [18]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=
```

In [19]:
```
X_train.head()
```

Out[19]:

	Latitude	Longitude	Month	Hour	Humidity	AmbientTemp	Wind.Speed	Visibility	Pressure
13445	38.82	-104.71	8	14	12.55493	40.06035	7	10.0	814.8
12101	44.89	-93.20	9	10	60.29663	21.34125	7	10.0	986.6
1701	40.67	-86.15	5	10	73.46191	20.08240	13	10.0	990.8
20817	38.95	-104.83	8	10	46.88110	23.82118	17	10.0	803.7
5983	26.98	-80.11	12	11	39.95972	34.12613	7	10.0	1023.3

In [20]:
```
y_train.head()
```

Out[20]:
```
13445    2.977541
12101    2.473713
1701     1.135388
20817    2.625887
5983     2.990197
Name: PolyPwr, dtype: float64
```

Baseline Regression Models

Decision Tree Regression

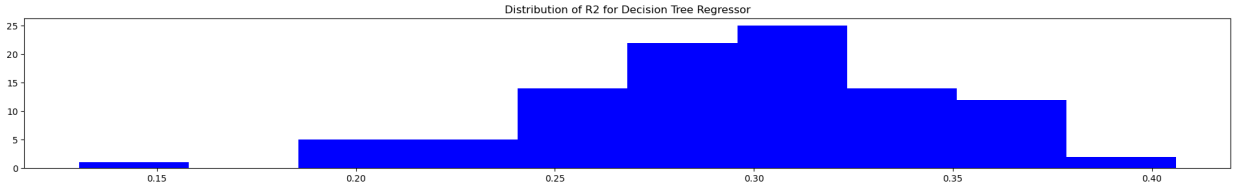
In [21]:
```
%%time
from sklearn.tree import DecisionTreeRegressor

kfoldcv = RepeatedKFold(n_splits=10, n_repeats=10, random_state=12)
power_dt = DecisionTreeRegressor().fit(X_train, y_train)
dt_scores = cross_val_score(power_dt, X_train, y_train, scoring='r2', cv=kfoldcv)

# Runtime = 9s
```

```
Wall time: 9.15 s
```

In [22]:
```
dt_scores
```

Out[22]:
```
array([0.23855723, 0.37461062, 0.33145153, 0.28960596, 0.28691863,
       0.29192033, 0.31658369, 0.29123383, 0.30741764, 0.25087916,
       0.27976961, 0.2869817 , 0.36683055, 0.30879064, 0.26702505,
       0.18582782, 0.33966565, 0.27611407, 0.34076591, 0.24312834,
       0.23930504, 0.32084317, 0.29048536, 0.27611632, 0.30238719,
       0.30599911, 0.27515647, 0.35933663, 0.2409954 , 0.35595697,
       0.31263381, 0.32545192, 0.34686205, 0.4060924 , 0.13043393,
       0.37754965, 0.28389883, 0.28409136, 0.38025142, 0.2983773 ,
       0.36022956, 0.27918708, 0.31001213, 0.31540559, 0.24101741,
       0.31749426, 0.30813108, 0.19144015, 0.30862916, 0.25177263,
       0.28828917, 0.34003375, 0.24694532, 0.21677116, 0.24313928,
       0.20265049, 0.25593115, 0.32610572, 0.31985606, 0.29856917,
       0.3187837 , 0.25488554, 0.29947124, 0.26416225, 0.32577965,
       0.35470718, 0.35511388, 0.31680492, 0.3396352 , 0.27513221,
       0.25085604, 0.29749745, 0.23764788, 0.29677315, 0.295745  ,
       0.28411402, 0.30422576, 0.31353419, 0.35224174, 0.247486  ,
       0.26180718, 0.34247547, 0.29276139, 0.34434878, 0.36051692,
       0.290593  , 0.27683384, 0.3055135 , 0.33193262, 0.19235018,
       0.36316496, 0.32997349, 0.31375311, 0.28699096, 0.34989672,
       0.23959774, 0.29945452, 0.27895564, 0.19406074, 0.35755089])
```

In [23]:
```
plt.figure(figsize=(24,3))
plt.hist(dt_scores, color='blue')
plt.title("Distribution of R2 for Decision Tree Regressor")
plt.savefig('dtr1.png')
plt.show()
```



In [24]:
```
dt_meanscore = np.mean(dt_scores)
```

Random Forest Regression

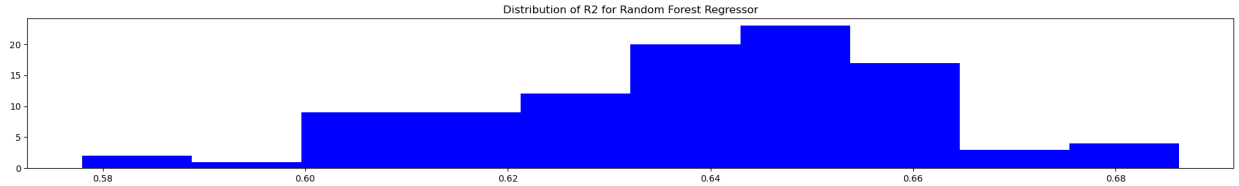
In [25]:
```
%%time
from sklearn.ensemble import RandomForestRegressor

power_rf = RandomForestRegressor().fit(X_train, y_train)
rf_scores = cross_val_score(power_rf, X_train, y_train, scoring='r2', cv=kfoldcv)

# Runtime = 9m 59s
```

```
Wall time: 9min 59s
```

In [26]:
```
rf_scores
```

Out[26]:
```
array([0.63164937, 0.68048528, 0.65433672, 0.60038133, 0.63563267,
       0.63382203, 0.64153402, 0.65462507, 0.66008134, 0.60498458,
       0.62302188, 0.63379531, 0.66855421, 0.65019412, 0.62451725,
       0.61521467, 0.62296551, 0.63497746, 0.65401319, 0.63366116,
       0.61610826, 0.65215575, 0.6012833 , 0.68624721, 0.63235396,
       0.6360014 , 0.64552206, 0.655309  , 0.61204972, 0.66357578,
       0.64811364, 0.62196036, 0.64599526, 0.64548421, 0.57797536,
       0.65711332, 0.64857158, 0.62230134, 0.65816701, 0.65890172,
       0.61953654, 0.65902108, 0.66209068, 0.65182277, 0.64481249,
       0.6127663 , 0.60401548, 0.63447743, 0.64856178, 0.61266391,
       0.64476014, 0.66830059, 0.65084913, 0.58642093, 0.60593733,
       0.63906568, 0.65333782, 0.60486546, 0.68474891, 0.64326864,
       0.65946603, 0.62242122, 0.64843351, 0.60060866, 0.64740312,
       0.6523594 , 0.63706254, 0.61982533, 0.65794424, 0.63276504,
       0.62455482, 0.64899689, 0.59024273, 0.64100178, 0.61510855,
       0.64474202, 0.64947518, 0.6390547 , 0.68157067, 0.63669836,
       0.6398374 , 0.62661603, 0.66946986, 0.63845558, 0.6269059 ,
       0.64972314, 0.61610997, 0.63987557, 0.63966837, 0.64394405,
       0.65942192, 0.66395299, 0.62179429, 0.65549099, 0.65996684,
       0.60020524, 0.6414106 , 0.64949468, 0.60421623, 0.62481058])
```

In [27]:
```
plt.figure(figsize=(24,3))
plt.hist(rf_scores, color='blue')
plt.title("Distribution of R2 for Random Forest Regressor")
plt.savefig('rfr1.png')
plt.show()
```



In [28]:
```
rf_meanscore = np.mean(rf_scores)
```

Support Vector Regression

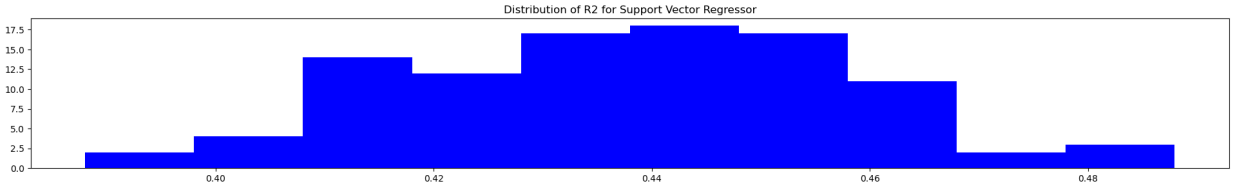
In [30]:
```
%%time
from sklearn.svm import SVR

power_svr = SVR().fit(X_train, y_train)
svr_scores = cross_val_score(power_svr, X_train, y_train, scoring='r2', cv=kfoldcv)

# Runtime = 17m 36s
```

```
Wall time: 17min 36s
```

In [33]:
```
svr_scores
```

Out[33]:
```
array([0.43353287, 0.45557418, 0.46151577, 0.40953165, 0.42671947,
       0.4357254 , 0.42652673, 0.4373433 , 0.45835264, 0.43376752,
       0.41682771, 0.43810608, 0.46384219, 0.43996571, 0.41735772,
       0.45821788, 0.41374181, 0.42325327, 0.42145354, 0.48008007,
       0.4210454 , 0.4674669 , 0.43886057, 0.45978914, 0.41495043,
       0.439632  , 0.43643204, 0.45655768, 0.41019224, 0.43048089,
       0.45813471, 0.43935703, 0.45355233, 0.38804249, 0.40604968,
       0.4524158 , 0.43989185, 0.40891477, 0.48794312, 0.44006313,
       0.41818702, 0.46922279, 0.42289729, 0.44350001, 0.44352057,
       0.44511043, 0.40053293, 0.44413708, 0.45623395, 0.43270822,
       0.4509607 , 0.44947522, 0.41395651, 0.40381828, 0.41942271,
       0.42821766, 0.48765959, 0.40917285, 0.44098302, 0.47472373,
       0.44602568, 0.43665393, 0.44885138, 0.40572361, 0.43677695,
       0.42106663, 0.46255806, 0.41658398, 0.45785528, 0.44270382,
       0.45324249, 0.4482138 , 0.39736113, 0.42997105, 0.41221064,
       0.45684278, 0.42379429, 0.45746677, 0.46221465, 0.43061481,
       0.4559806 , 0.42983859, 0.46667139, 0.4264358 , 0.43663028,
       0.45353439, 0.42825616, 0.41321793, 0.42277322, 0.44493474,
       0.44131273, 0.45824753, 0.4098081 , 0.44449403, 0.45325819,
       0.40901199, 0.45165933, 0.44120687, 0.4369049 , 0.43186174])
```

In [31]:
```
plt.figure(figsize=(24,3))
plt.hist(svr_scores, color='blue')
plt.title("Distribution of R2 for Support Vector Regressor")
plt.savefig('svr1.png')
plt.show()
```



In [32]:
```
svr_meanscore = np.mean(svr_scores)
```

K-Nearest Neighbors Regression

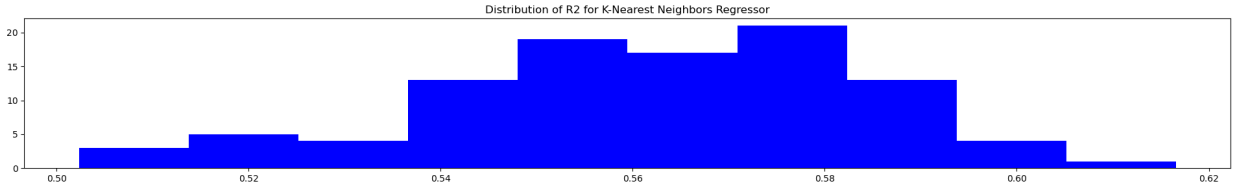
In [34]:
```
%%time
from sklearn.neighbors import KNeighborsRegressor

power_knn = KNeighborsRegressor(11).fit(X_train, y_train)
knn_scores = cross_val_score(power_knn, X_train, y_train, scoring='r2', cv=kfoldcv)

# Runtime = 8s
```

```
Wall time: 7.53 s
```

In [35]:
```
knn_scores
```

Out[35]:
```
array([0.55643159, 0.6039745 , 0.57400005, 0.5424044 , 0.54926928,
       0.55005709, 0.55513075, 0.58497964, 0.58996029, 0.51890493,
       0.52676248, 0.56980968, 0.58523717, 0.58371292, 0.55793359,
       0.53069   , 0.55272127, 0.56247409, 0.56857669, 0.58127398,
       0.54215138, 0.58217895, 0.5023569 , 0.59179498, 0.55577036,
       0.55185722, 0.58578495, 0.60116241, 0.51866418, 0.57077815,
       0.58596435, 0.55362978, 0.55557983, 0.55264779, 0.50659141,
       0.5647733 , 0.57473573, 0.56875063, 0.59183946, 0.58214275,
       0.53666518, 0.59493573, 0.56951606, 0.58936321, 0.57085644,
       0.55593881, 0.54136685, 0.53909794, 0.57285775, 0.53578235,
       0.58530382, 0.58233332, 0.56940313, 0.52096993, 0.56186691,
       0.55313492, 0.58357734, 0.5249669 , 0.58579104, 0.56167008,
       0.57655016, 0.55837041, 0.57536   , 0.54192577, 0.57973463,
       0.57525598, 0.57556649, 0.52193221, 0.57262082, 0.5662034 ,
       0.56380072, 0.58142725, 0.50978674, 0.55479361, 0.553635  ,
       0.57166664, 0.54767159, 0.57554268, 0.61658189, 0.54627655,
       0.56150233, 0.5683326 , 0.57873812, 0.56621282, 0.55273075,
       0.59898578, 0.54752643, 0.52894969, 0.54607334, 0.57655871,
       0.55825353, 0.58157291, 0.53670312, 0.57157891, 0.57275194,
       0.54666298, 0.57476467, 0.57087779, 0.54546746, 0.55043085])
```

In [36]:
```
plt.figure(figsize=(24,3))
plt.hist(knn_scores, color='blue')
plt.title("Distribution of R2 for K-Nearest Neighbors Regressor")
plt.savefig('knn1.png')
plt.show()
```



In [37]:
```
knn_meanscore = np.mean(knn_scores)
```

Hyperparameter Tuning

In [38]:
```
from sklearn.model_selection import GridSearchCV

dtr = DecisionTreeRegressor()
rfr = RandomForestRegressor()
svr = SVR()
knn = KNeighborsRegressor()
```

In [39]:
```
%%time
# Decision Tree
dtr_params = {'max_depth':np.arange(1,20), 'max_features':np.arange(1,15), 'min_sample
hyp_dtr = GridSearchCV(dtr, param_grid=dtr_params, cv=5)
hyp_dtr.fit(X_train, y_train)
hyp_dtr.best_params_

# Runtime = 11m 24s
```

```
Wall time: 11min 24s
```

Out[39]:
```
{'max_depth': 12, 'max_features': 10, 'min_samples_leaf': 35}
```

In [40]:
```
%%time
# Random Forest
rfr_params = {'max_features':np.arange(1,15), 'min_samples_leaf':np.arange(50,500,50),
hyp_rfr = GridSearchCV(rfr, param_grid=rfr_params, cv=5)
hyp_rfr.fit(X_train, y_train)
hyp_rfr.best_params_

# Runtime = 1h 6m 30s
```

```
Wall time: 1h 6min 30s
```

Out[40]:
```
{'max_features': 10, 'min_samples_leaf': 50, 'n_estimators': 50}
```

In [41]:
```
%%time
# Support Vector
svr_params = {'C': [0.1, 1, 10, 100, 1000]}
hyp_svr = GridSearchCV(svr, param_grid=svr_params, cv=5)
hyp_svr.fit(X_train, y_train)
hyp_svr.best_params_

# Runtime = ~5m 25s
```

```
Wall time: 5min 25s
```

Out[41]:
```
{'C': 1000}
```

In [42]:
```
%%time
# KNN
knn_params = {'n_neighbors':np.arange(1, 50), 'p':[1,2], 'weights': ['uniform', 'dista
hyp_knn = GridSearchCV(knn, param_grid=knn_params, cv=5)
hyp_knn.fit(X_train, y_train)
hyp_knn.best_params_

# Runtime = 2m 52s
```

```
Wall time: 2min 52s
```

Out[42]:
```
{'n_neighbors': 18, 'p': 1, 'weights': 'distance'}
```

New Model Iteration

Decision Tree Regression

In [43]:
```
%%time
from sklearn.tree import DecisionTreeRegressor

kfoldcv = RepeatedKFold(n_splits=10, n_repeats=10, random_state=12)
power_hpdt = DecisionTreeRegressor(max_depth=12, max_features=8, min_samples_leaf=20).
hpdt_scores = cross_val_score(power_hpdt, X_train, y_train, scoring='r2', cv=kfoldcv)

# Runtime = 4s
```

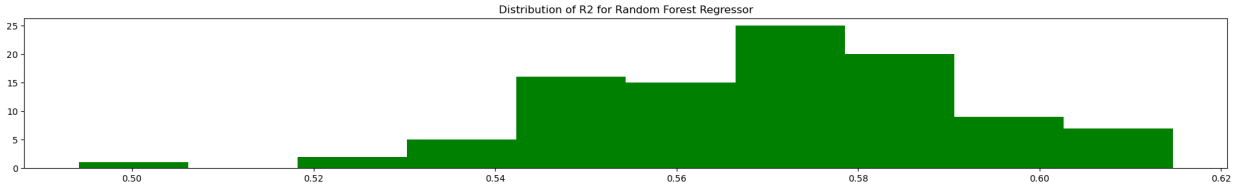
```
Wall time: 3.81 s
```

In [44]:
```
hpdt_scores
```

Out[44]:
```
array([0.55395398, 0.57861574, 0.56572793, 0.55224841, 0.56290692,
       0.57930121, 0.5654054 , 0.58169319, 0.60049441, 0.56236897,
       0.54392414, 0.52524893, 0.60855545, 0.60321456, 0.54885723,
       0.56415836, 0.56392373, 0.57034464, 0.55230639, 0.59806266,
       0.54773005, 0.58466592, 0.55195251, 0.61468817, 0.57069535,
       0.58297067, 0.58154226, 0.57743973, 0.54033516, 0.57552582,
       0.57245901, 0.57919641, 0.60678236, 0.57741026, 0.53426178,
       0.5881036 , 0.56625632, 0.5449352 , 0.60953322, 0.5745545 ,
       0.55167188, 0.59441937, 0.56806685, 0.60138104, 0.5713408 ,
       0.57350196, 0.5492456 , 0.57290491, 0.58517963, 0.54016277,
       0.57411795, 0.59347574, 0.58505653, 0.54354618, 0.5520447 ,
       0.56715704, 0.59384663, 0.55926257, 0.60630575, 0.57959273,
       0.59572224, 0.57080818, 0.57571966, 0.52403368, 0.57249055,
       0.55906318, 0.57200607, 0.5508136 , 0.59368054, 0.57784906,
       0.57146984, 0.57982998, 0.49415218, 0.55240305, 0.56216956,
       0.5708034 , 0.56448889, 0.56929037, 0.60699306, 0.55470612,
       0.57062529, 0.57475813, 0.60163863, 0.58833667, 0.54525165,
       0.58960985, 0.56289148, 0.56563914, 0.57947607, 0.5787974 ,
       0.5831743 , 0.58323899, 0.53702229, 0.57887183, 0.58868214,
       0.53381085, 0.57448278, 0.57366383, 0.55332663, 0.56557522])
```

In [45]:
```
hpdt_meanscore = np.mean(hpdt_scores)
```

In [46]:
```
plt.figure(figsize=(24,3))
plt.hist(hpdt_scores, color='green')
plt.title("Distribution of R2 for Random Forest Regressor")
plt.savefig('dtr2.png')
plt.show()
```



Random Forest Regression

In [47]:
```
%%time
from sklearn.ensemble import RandomForestRegressor

power_hprf = RandomForestRegressor(max_features=9, min_samples_leaf=50, n_estimators=2
hprf_scores = cross_val_score(power_hprf, X_train, y_train, scoring='r2', cv=kfoldcv)

# Runtime = 8m 55s
```

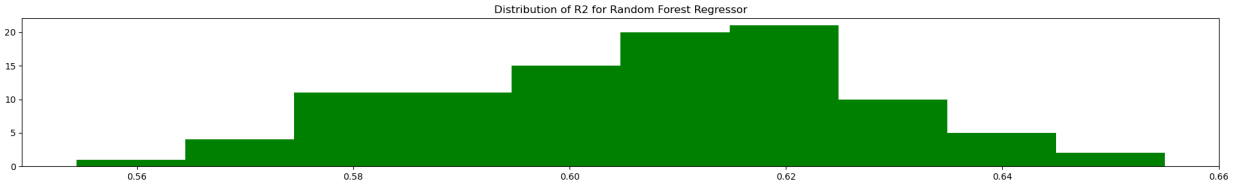
```
Wall time: 7min 49s
```

In [48]:
```
hprf_scores
```

Out[48]:
```
array([0.60746498, 0.6310848 , 0.60882577, 0.58056683, 0.60023116,
       0.6030345 , 0.60495111, 0.61042684, 0.63423976, 0.58982505,
       0.58498473, 0.59659114, 0.63941086, 0.61732156, 0.58583944,
       0.61043456, 0.59163105, 0.6084887 , 0.6066329 , 0.62213404,
       0.57885149, 0.6202147 , 0.58709983, 0.64845785, 0.59717662,
       0.611823  , 0.60705213, 0.61692142, 0.57949197, 0.62137805,
       0.62321929, 0.60316647, 0.61330264, 0.60017435, 0.56660154,
       0.62195859, 0.60002411, 0.5719393 , 0.63628178, 0.62342462,
       0.58582618, 0.63530392, 0.62243039, 0.62595775, 0.60752335,
       0.58411313, 0.56476924, 0.61286379, 0.62141121, 0.59563789,
       0.61880067, 0.62514136, 0.6004509 , 0.5663212 , 0.58169412,
       0.60736706, 0.64269011, 0.57718075, 0.62842353, 0.62460127,
       0.61626472, 0.60973538, 0.60997468, 0.5779606 , 0.61489555,
       0.59646138, 0.62077041, 0.57776096, 0.62497441, 0.62260626,
       0.60730319, 0.61896761, 0.55441808, 0.61364754, 0.58326806,
       0.616213  , 0.6015276 , 0.61758011, 0.65502208, 0.59216901,
       0.60220014, 0.60351407, 0.63619838, 0.61400702, 0.58298823,
       0.62898262, 0.60306876, 0.59148615, 0.59629087, 0.60995284,
       0.62496148, 0.62590851, 0.58814738, 0.61625035, 0.62657362,
       0.57631889, 0.61231169, 0.61979715, 0.59361677, 0.58871932])
```

In [49]:
```
hprf_meanscore = np.mean(hprf_scores)
```

In [50]:
```
plt.figure(figsize=(24,3))
plt.hist(hprf_scores, color='green')
plt.title("Distribution of R2 for Random Forest Regressor")
plt.savefig('rfr2.png')
plt.show()
```



Support Vector Regression

In [51]:
```
%%time
from sklearn.svm import SVR

power_hpsvr = SVR(C=1000).fit(X_train, y_train)
hpsvr_scores = cross_val_score(power_hpsvr, X_train, y_train, scoring='r2', cv=kfoldcv

# Runtime = 26m 55s
```

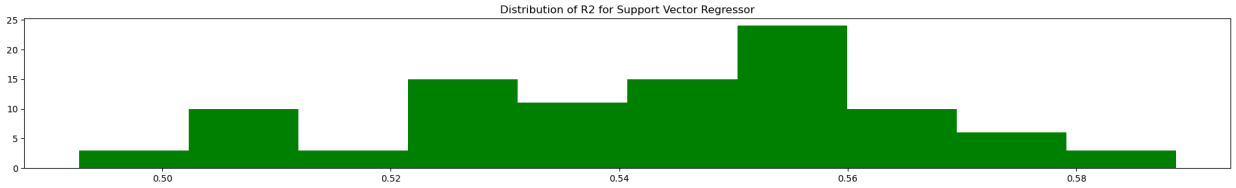
```
Wall time: 26min 55s
```

In [52]:
```
hpsvr_scores
```

Out[52]:
```
array([0.54257892, 0.56550197, 0.55606864, 0.50123358, 0.5290404 ,
       0.52797658, 0.54386631, 0.55531688, 0.56308019, 0.54166411,
       0.51401851, 0.52913358, 0.56715446, 0.54604965, 0.52103942,
       0.55319523, 0.53060669, 0.54898636, 0.53947816, 0.57098171,
       0.50704623, 0.57035902, 0.54115065, 0.57305806, 0.52475885,
       0.56078322, 0.54765974, 0.5511189 , 0.51984382, 0.53149767,
       0.55780693, 0.53630263, 0.55047733, 0.52882156, 0.5053545 ,
       0.55558968, 0.5385568 , 0.50794688, 0.57849854, 0.56080903,
       0.53351034, 0.57502881, 0.5492774 , 0.55765206, 0.55269625,
       0.52474043, 0.50280958, 0.54733342, 0.55731521, 0.52191552,
       0.55827758, 0.55320329, 0.52380789, 0.49715724, 0.52745039,
       0.53407461, 0.58133598, 0.51095012, 0.54973812, 0.58872357,
       0.54712465, 0.55101579, 0.55210007, 0.50990082, 0.55362502,
       0.53082123, 0.55378875, 0.50817371, 0.5667118 , 0.55035481,
       0.54411043, 0.55750439, 0.49272128, 0.54542238, 0.51171903,
       0.56027938, 0.53608585, 0.55946601, 0.58182122, 0.53373187,
       0.55557376, 0.53508624, 0.56032923, 0.52276895, 0.53249562,
       0.57515294, 0.52511656, 0.52727814, 0.52916216, 0.56149291,
       0.54933462, 0.55341323, 0.50965104, 0.55656705, 0.56149117,
       0.50910567, 0.55097749, 0.55524057, 0.54366737, 0.5358538 ])
```

In [53]:
```
hpsvr_meanscore = np.mean(hpsvr_scores)
```

In [54]:
```
plt.figure(figsize=(24,3))
plt.hist(hpsvr_scores, color='green')
plt.title("Distribution of R2 for Support Vector Regressor")
plt.savefig('svr2.png')
plt.show()
```



K-Nearest Neighbors Regression

In [55]:
```
%%time
from sklearn.neighbors import KNeighborsRegressor

power_hpknn = KNeighborsRegressor(n_neighbors=18, p=1, weights='distance').fit(X_train
hpknn_scores = cross_val_score(power_hpknn, X_train, y_train, scoring='r2', cv=kfoldcv

# Runtime = 9s
```

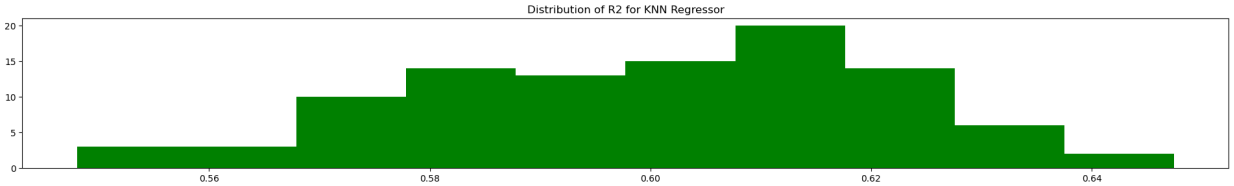
```
Wall time: 8.2 s
```

In [56]:
```
hpknn_scores
```

Out[56]:
```
array([0.59200908, 0.63845258, 0.61033611, 0.56982968, 0.58518831,
       0.58629452, 0.60151665, 0.61976607, 0.63552464, 0.56575955,
       0.57585305, 0.59649413, 0.62051276, 0.61614704, 0.58259278,
       0.5771494 , 0.58751787, 0.60768887, 0.60380595, 0.61924993,
       0.57870332, 0.61940848, 0.55086973, 0.63255406, 0.58634286,
       0.59313486, 0.61762921, 0.62437658, 0.57739531, 0.60853329,
       0.61076555, 0.59484353, 0.60170247, 0.60166202, 0.54803643,
       0.6013195 , 0.60769421, 0.59573575, 0.63009926, 0.6245135 ,
       0.56918695, 0.63061039, 0.61600073, 0.62944124, 0.6053986 ,
       0.58377082, 0.57932328, 0.58076761, 0.61283405, 0.57325916,
       0.6176729 , 0.62323587, 0.60202622, 0.56926929, 0.59569477,
       0.59240149, 0.61925427, 0.56560243, 0.62156131, 0.60992087,
       0.62123457, 0.59615526, 0.60745413, 0.58401511, 0.61924818,
       0.59805271, 0.61052045, 0.57160296, 0.61381656, 0.59719064,
       0.5947553 , 0.60778167, 0.55389796, 0.60005773, 0.58568405,
       0.61605763, 0.60023916, 0.60484937, 0.64745352, 0.58098152,
       0.60257963, 0.60008361, 0.61885293, 0.6089992 , 0.592584  ,
       0.6291821 , 0.58471728, 0.56842727, 0.58975687, 0.61343935,
       0.60164648, 0.61621599, 0.56774844, 0.61235618, 0.61459906,
       0.57612771, 0.60829634, 0.61673369, 0.58607625, 0.59499566])
```

In [57]:
```
hpknn_meanscore = np.mean(hpknn_scores)
```

In [58]:
```
plt.figure(figsize=(24,3))
plt.hist(hpknn_scores, color='green')
plt.title("Distribution of R2 for KNN Regressor")
plt.savefig('knn2.png')
plt.show()
```



Comparison of Baseline Models and Tuned Models

In [59]:
```
power_compare = pd.DataFrame({
    'Model':['Decision Tree Regression', 'Random Forest Regression', 'Support Vector R
    'Baseline':[dt_meanscore, rf_meanscore, svr_meanscore, knn_meanscore],
    'Hyperparametric Tuned':[hpdt_meanscore, hprf_meanscore, hpsvr_meanscore, hpknn_me
})

power_compare
```

Out[59]:

	Model	Baseline	Hyperparametric Tuned
0	Decision Tree Regression	0.296050	0.570720
1	Random Forest Regression	0.637961	0.606640
2	Support Vector Regression	0.437584	0.542376
3	KNN Regression	0.562182	0.600087

Prediction on test set with best performing

model

In [68]:
```
%%time
y_pred = power_rf.predict(X_test)
```

```
Wall time: 320 ms
```

In [69]:
```
predictions = pd.DataFrame({'Actual':y_test, 'Predicted':y_pred})
```

In [71]:
```
predictions.head(10)
```

Out[71]:

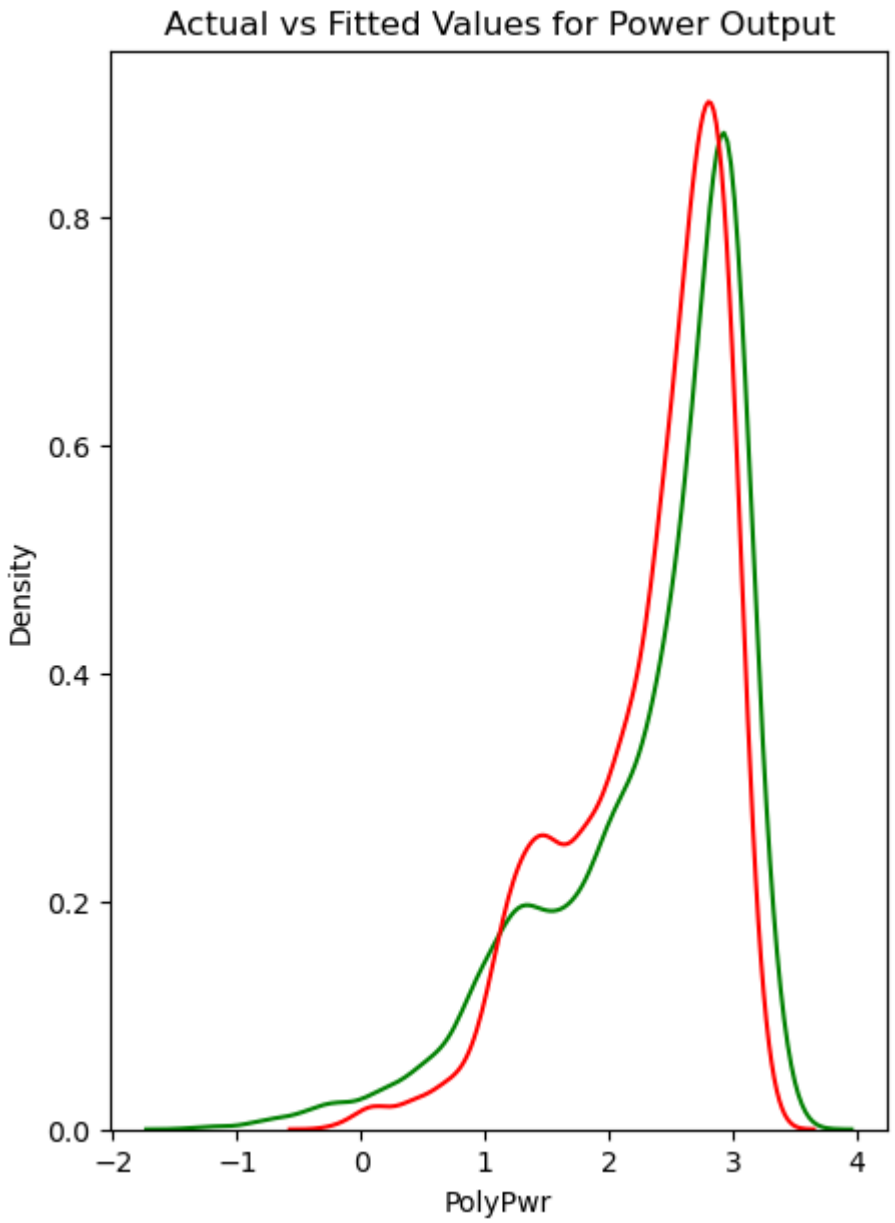
	Actual	Predicted
5538	3.315285	3.104755
1124	1.965618	1.838612
15612	2.123391	2.201996
5398	3.208179	2.896573
100	0.481475	0.509808
16712	1.332970	1.498533
20047	2.328569	2.913947
5729	2.334629	2.340823
1229	1.727887	1.858999
17422	0.236526	0.065932

In [72]:
```
print('R2:', r2_score(y_test, y_pred))
print('MAE:', np.sqrt(mean_absolute_error(y_test, y_pred)))
print('RMSE:', np.sqrt(mean_squared_error(y_test, y_pred)))
```

```
R2: 0.6351817211308615
MAE: 0.5570463865620227
RMSE: 0.4903051293803285
```

In [67]:
```
plt.figure(figsize=(5, 7))

ax = sns.distplot(y_test, hist=False, color='g', label='Actual Value')
sns.distplot(y_pred, hist=False, color='r', label='Fitted Values', ax=ax)

plt.title('Actual vs Fitted Values for Power Output')
plt.show()
```

```
C:\Users\anaab\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `kdeplot` (an axes-level function for kernel density plots).
  warnings.warn(msg, FutureWarning)
C:\Users\anaab\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `kdeplot` (an axes-level function for kernel density plots).
  warnings.warn(msg, FutureWarning)
```


Actual vs Fitted Values for Power Output
Density
0.0
0.2
0.4
0.6
0.8
−2
−1
0
1
2
3
4
PolyPwr