I have a database of Star dataset to predict star types. As an astrophysicist, I want to classify stars based on their spectral class and understand the relationship between their temperature, luminosity, radius, and absolute magnitude.

ReAct-DACO (Action 1)

```
# Calculate correlation matrix
for the numerical features
correlation_matrix = db['6
class csv']][['Temperature (K)',
'Luminosity(L/Lo)',
'Radius(R/Ro)', 'Absolute
magnitude(Mv)']].corr()
```

```
Temperature (K)  Luminosity(L/Lo)
Radius(R/Ro)  \
count      240.000000       240.000000
240.000000
mean     10497.462500
107188.361635    237.157781
std       9552.425037
179432.244940    517.155763
.....
```

ReAct-DACO (Action 2)

```
# Calculate the size of each
star type by spectral class
class_distribution = db['6
class
csv'].groupby(['Spectral
Class', 'Star
type']).size().unstack(fill_v
alue=0)
```

```
Star type Spectral Class  Temperature
(K)  Luminosity(L/Lo)  Radius(R/Ro)
\
0         0            M     2997.950000
0.000693     0.110015
1         1            M     3283.825000
0.005406     0.348145
.....
```

.....

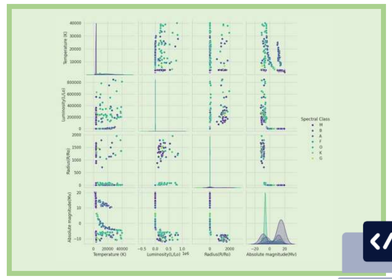
Final Summary Report

- 1. Luminosity and absolute magnitude show **a strong negative correlation** (-0.69), indicating that as luminosity increases, absolute magnitude decreases (better brightness suggests higher luminosity).**Radius is also negatively correlated with absolute magnitude** (-0.61) suggesting that larger stars tend to have lower absolute magnitudes (higher brightness).
- 2. The mean values by star type and spectral class indicate that specific spectral classes (like M and B) are more prominent in specific star types. For instance, all star types have representation in spectral class M, while types 2 and 3 show a variety of spectral classes including A, B, and F.
- 3. Most of the stars are classified as type 0 (40 instances of M, 0 for other classes) and type 2 covers a range of spectral classes, highlighting the diversity in star types across the different spectral classifications.

Argos (Action 1)

Thought: We can start by creating visualizations that show how the temperature, luminosity, radius, and absolute magnitude interact with each other, particularly focusing on stratifying these by the spectral class
Action Description: Generate a pairplot to visualize the pairwise relationships
Team for Action: visual team

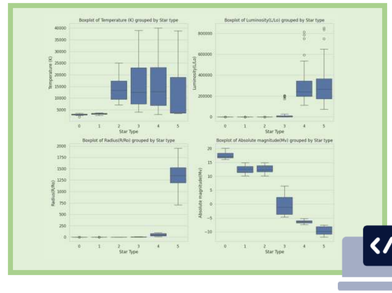
```
# Create a pairplot
sns.set(style='whitegrid')
pairplot = sns.pairplot(data,
vars=['Temperature (K)',
'Luminosity(L/Lo)',
'Radius(R/Ro)', 'Absolute
magnitude(Mv)'])
```



Argos (Action 2)

Thought: We can create boxplots to show how these numeric features vary across different star types, which can provide further insights into where the boundaries for classification may lie.
Action Description: Generate boxplots for 'Temperature (K)', 'Luminosity(L/Lo)', 'Radius(R/Ro)', and 'Absolute magnitude(Mv)' grouped by 'Star type'
Team for Action: visual team

```
# Loop through the features
and create a boxplot
for i, feature in
enumerate(features):
    sns.boxplot(x='Star
type', y=feature, data=data,
ax=axs[i])
```



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Final Summary Report

- 1. The luminosity shows a significant standard deviation (179,432.24), **indicating considerable variability in luminosity levels across star classifications**. High luminosities correspond with lower absolute magnitudes, revealing **a strong negative correlation** (-0.692) between these variables.
- 2. The analysis indicates **a moderate positive correlation** (0.393) between temperature and luminosity, hinting that hotter stars tend to be more luminous. Furthermore, **a negative correlation exists between both radius and absolute magnitude** (-0.609) **as well as temperature and absolute magnitude** (-0.420), indicating that larger or hotter stars are generally brighter.
- 3. Visualizations reveal distinct relationships among the star features, especially in the luminary and temperature pair plots, suggesting that **specific spectral classes influence temperature and luminosity, with obvious clusters present for different star types**.
- 4. Boxplots delineate clear distributions across star types, showing that **higher classifications tend to be associated with higher medians in both temperature and luminosity**, while exhibiting lower absolute magnitudes. **Outliers were also noted in luminosity and temperature**, warranting further examination.