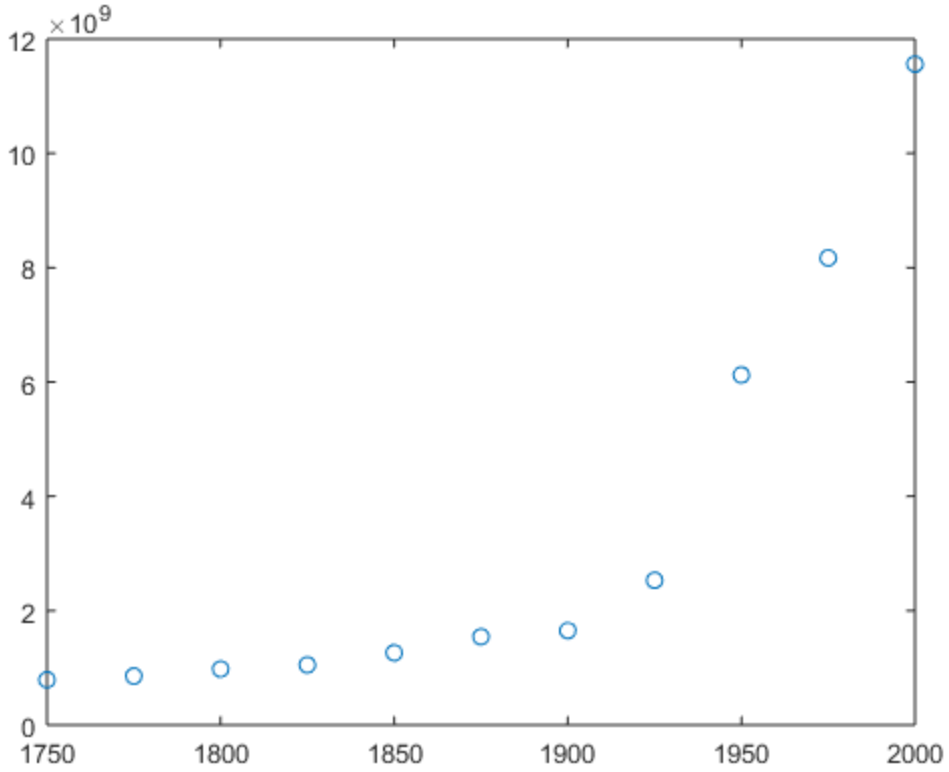
Use Centering and Scaling to Improve Numerical Properties

Create a table of population data for the years 1750 - 2000 and plot the data points.

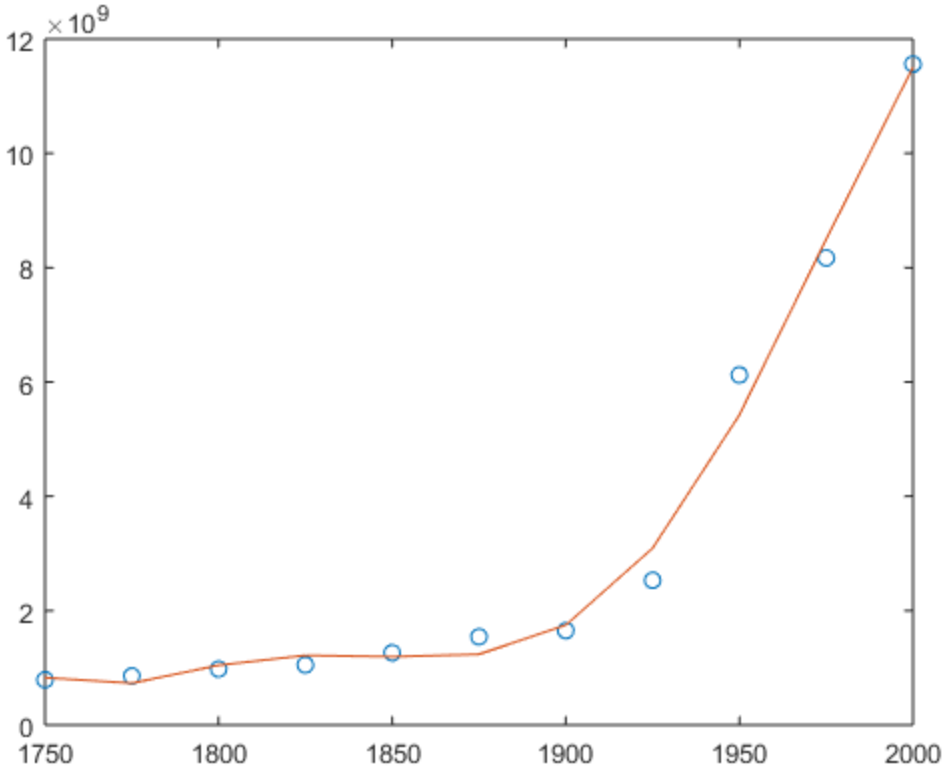
```
year = (1750:25:2000)';
pop = 1e6*[791 856 978 1050 1262 1544 1650 2532 6122 8170 11560]';
T = table(year, pop)
plot(year,pop,'o')
```

```
T =

    year       pop
    ____    _________

    1750     7.91e+08
    1775     8.56e+08
    1800     9.78e+08
    1825     1.05e+09
    1850    1.262e+09
    1875    1.544e+09
    1900     1.65e+09
    1925    2.532e+09
    1950    6.122e+09
    1975     8.17e+09
    2000    1.156e+10
```



Use `polyfit` with three outputs to fit a 5th-degree polynomial using centering and scaling, which improves the numerical properties of the problem. `polyfit` centers the data in `year` at 0 and scales it to have a standard deviation of 1, which avoids an ill-conditioned Vandermonde matrix in the fit calculation.

```
[p,~,mu] = polyfit(T.year, T.pop, 5);
% Use |polyval| with four inputs to evaluate |p| with the scaled
 years,
% |(year-mu(1))/mu(2)|. Plot the results against the original years.
%  mu = (1.87500.0829)  1.0e+03
f = polyval(p,year,[],mu);
hold on
plot(year,f)
hold off
```



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