MATLAB debugger example

- debug_example.m: runs the function unit_scale_data on two arrays; it fails on the second call because the input is 2-D.

```matlab
function debug_example

x = [1 2 3 4]
xn = unit_scale_data(x)

% second call will cause an error - x is 2-D.
x = magic(2)
xn = unit_scale_data(x)
```
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• Output will be:

```
>> debug_example
x =
     1     2     3     4
xn =
     0   0.3333   0.6667    1.0000
x =
     1     3
     4     2
??? Error using ==> minus
Matrix dimensions must agree.
```

Note that the “correct” answer for the second call should be:

```
x =
     1     3
     4     2
x =
     0   0.6667
     1.000   0.3333
```
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- Setting `dbstop if error` halts execution at the location of the error, but the function cannot be resumed (see `help dbstop`).
- If you wrap the call within a `try ... catch ... end`, it is possible to resume the function.
- Change the calls inside `debug_example` to `unit_scale_data_data_catch`, and run again.
try
  output_data = output_data - data_min;
  output_data = output_data / (data_max - data_min);
catch
  disp('Error during data rescaling')
end
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- New result – error is “caught”, x is returned, unmodified:

```matlab
>> debug_example
x =
   1   2   3   4
xn =
   0  0.3333  0.6667  1.0000
x =
   1   3
   4   2
Error during data rescaling
xn =
   1   3
   4   2
```

Now, set the debugger to catch a caught error:
```
dbstop if caught error
```
Caught errors

- MATLAB is now halted at line 24, but when you resume, it will skip past the catch block to line 26. So, if we want continue the function, we need to do two things:
  - 1. Correct the problem that leads to the error – in this case it is the fact that data_min and data_max are not scalars. Here is one possible fix:
    - `data_min=min(min(data));`
    - `data_max=max(max(data));`
  - 2. Rerun the code inside the catch block, that generated the error, which is being skipped:
    - `output_data=output_data-data_min;`
    - `output_data=output_data/(data_max-data_min);`
- Then you can continue the function with `dbcont`
Here is what a “corrected” run might look like:

```matlab
>> debug_example
x =
    1     2     3     4
xn =
    0   0.3333   0.6667    1.0000
x =
    1     3
    4     2
Caught-error breakpoint was hit in unit_scale_data_catch at line 24. The error was:

Error using ==> minus
Matrix dimensions must agree.
24    output_data = output_data - data_min;
K>> data_max = max(max(data)); data_min = min(min(data));
K>> output_data = output_data - data_min;
K>> output_data = output_data / (data_max - data_min);
K>> dbcont
Error during data rescaling
xn =
    0    0.6667
    1.0000    0.3333
```

These commands would be the ones typed in at the command line, while the program is halted. Note the “K>>” prompt.
Bottom line(s)

• Don't depend on this to “fix” code. If you find a runtime bug, it is always better to actually edit the code to fix the problem, and re-start the execution from the beginning.

• But, if you have a troublesome function call (meaning, you think it might cause a runtime error), you can put \texttt{try...catch...end} around it, and potentially “recover” a program run.

• This assumes the fix is easy enough to be done at the command line.

• The example was very simple – a real program might not be fixable at the command line!