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# Exceptions

GammaLib implements error handling using exceptions. The exceptions are implemented by the GException class. GammaLib distinguishes between **logic exceptions** and **runtime exceptions**.

## Logic exceptions

Logic exceptions occur in situations that a client could have tested. They comprise:

- invalid_value: a value is invalid
- invalid_argument: an argument passed to a method or a function is invalid
- out_of_range: a value is outside its valid range
- fits_error: an error occurred in a cfitsio routine

## Runtime exceptions

Runtime exceptions occur in situations that a client can not test. They comprise:

- underflow_error
- overflow_error
- feature_not_implemented: the requested feature is not yet implemented in GammaLib

## Example code

Below an example code that illustrates how exceptions should be implemented:

```
  if (num != m_cube.nmaps() ) {
     std::string msg = "Number of energies in 'ENERGIES' extension"
                       " ("+gammalib::str(num)+") does not match the"
                       " number of maps ("+gammalib::str(m_cube.nmaps())+""
                       " in the map cube.\n"
                       "The 'ENERGIES' extension table shall provide"
                       " one enegy value for each map in the cube.";
     throw GException::invalid_value(G_LOAD, msg);
  }
```

An error message should be composed using a std::string. This message is then passed to invalid_value, invalid_argument or any of the other standard exceptions. The G_LOAD macro defines the name of the method that actually throws the exception (and is defined in the header of the .cpp file):

```
#define G_LOAD                "GModelSpatialDiffuseCube::load(std::string&)"
```

Note that arguments are given in this definition without the const declaration and without the parameter name. If more than a single parameter exists, the parameter should be separated by a blank character:

```
#define G_MC          "GModelSpatialDiffuseCube::mc(GEnergy&, GTime&, GRan&)"
```