Step by Step guide to add a new fit model function into the GPUFIT

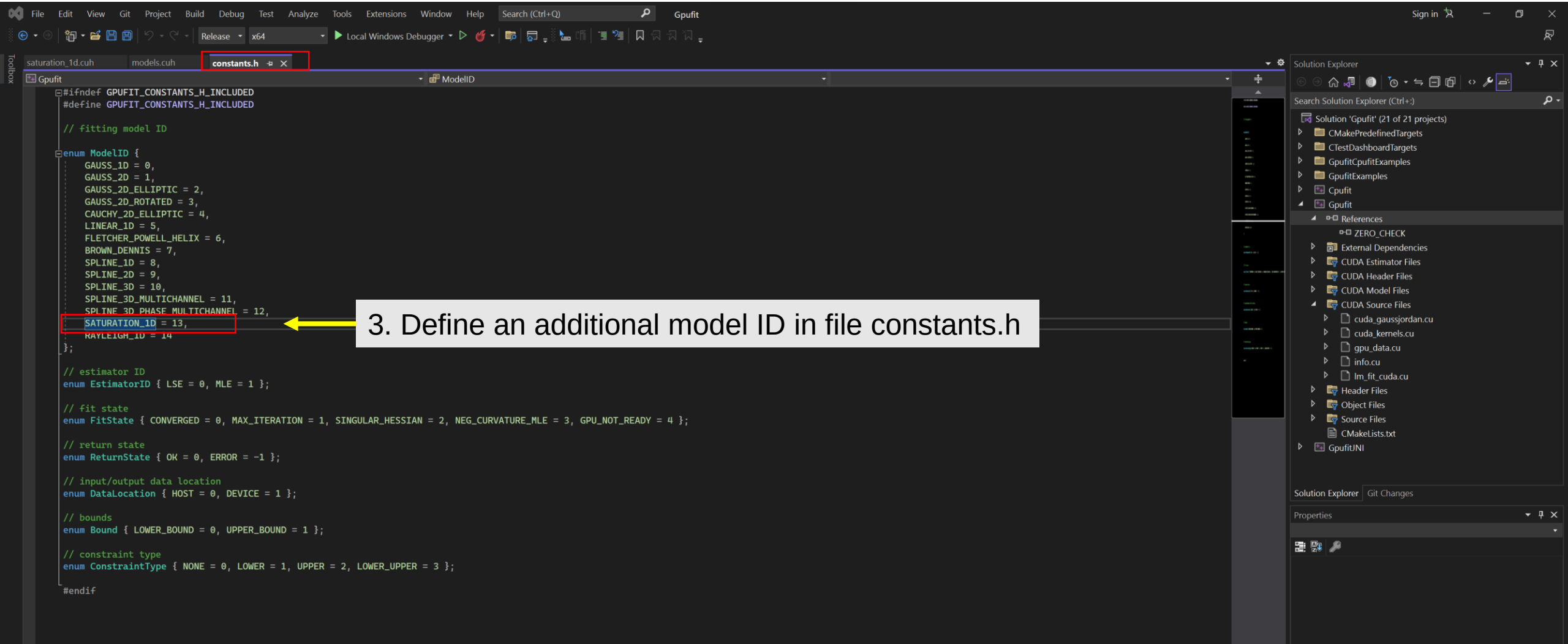
We strongly recommend to follow the installation procedure in Gpufit documentation:
https://gpufit.readthedocs.io/en/latest/index.html

Steps:

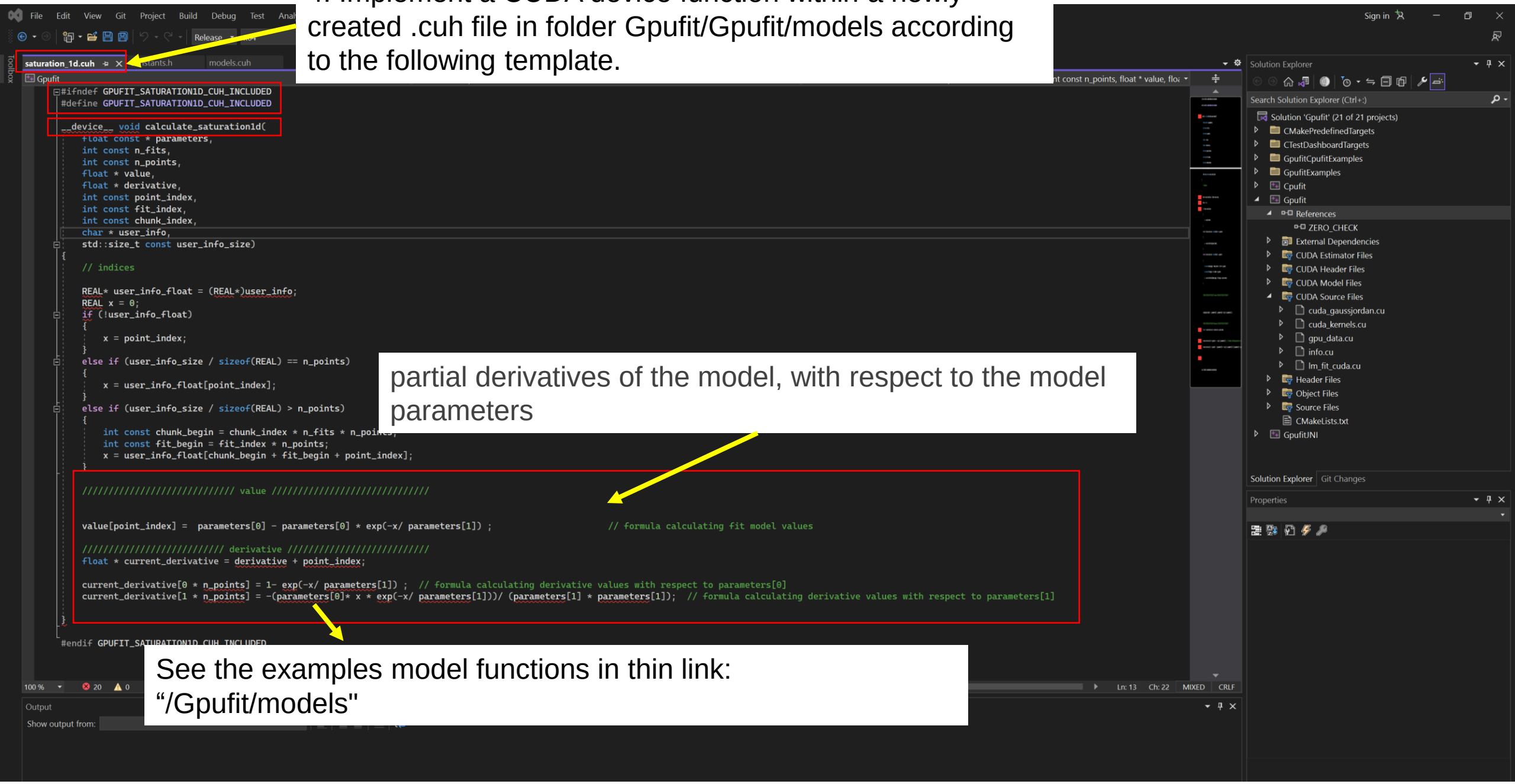
1. Download CUDA

   CUDA Toolkit 6.5 or later (tested with 6.5-11.4)

2. Download Visual Studio 2022

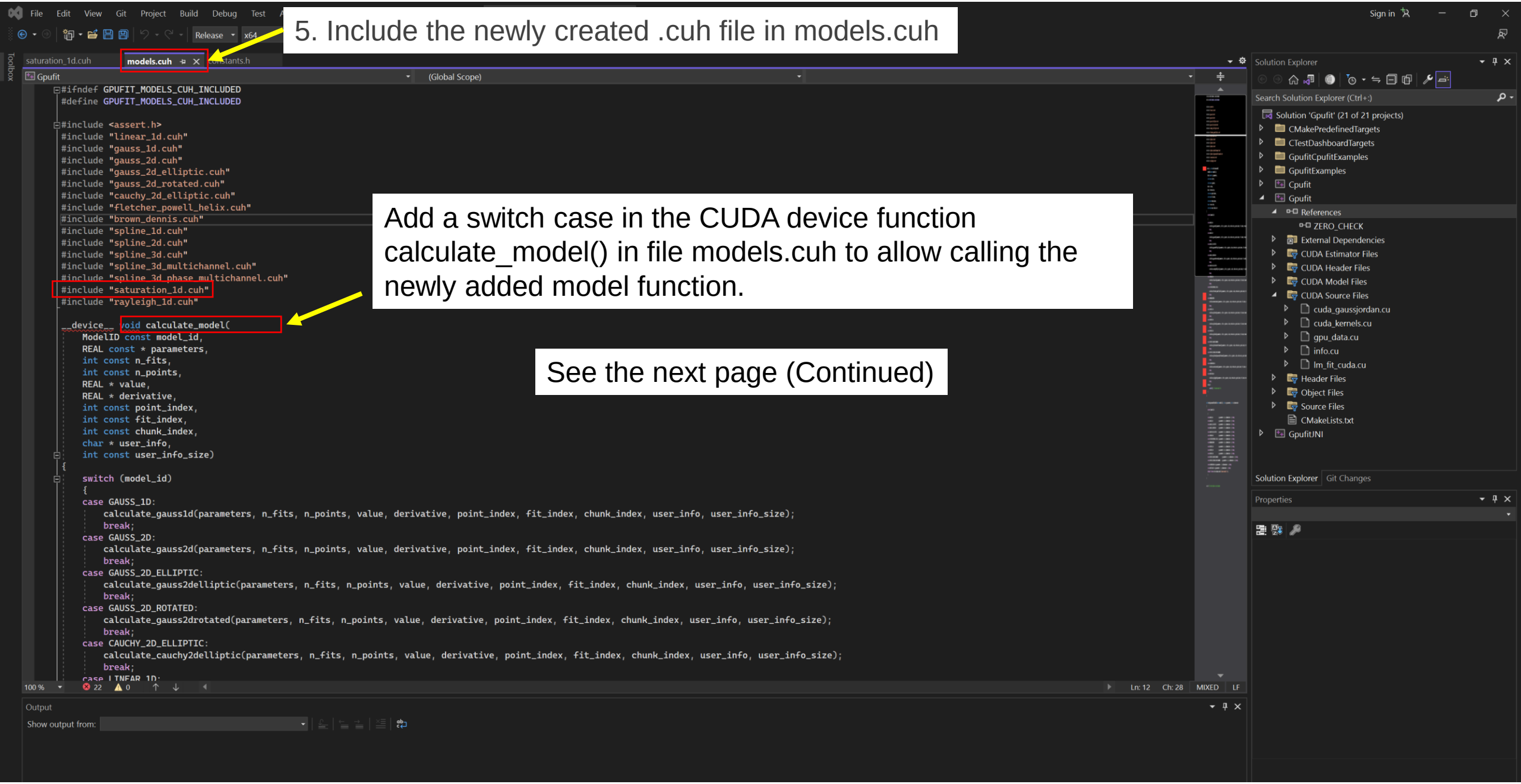


4. Implement a CUDA device function within a newly created .cuh file in folder Gpufit/Gpufit/models according to the following template.



partial derivatives of the model, with respect to the model parameters

See the examples model functions in thin link:
“/Gpufit/models"


5. Include the newly created .cuh file in models.cuh
saturation_1d.cuh
models.cuh
Gpufit
(Global Scope)
#ifndef GPUFIT_MODELS_CUH_INCLUDED
#define GPUFIT_MODELS_CUH_INCLUDED
#include <assert.h>
#include "linear_1d.cuh"
#include "gauss_1d.cuh"
#include "gauss_2d.cuh"
#include "gauss_2d_elliptic.cuh"
#include "gauss_2d_rotated.cuh"
#include "cauchy_2d_elliptic.cuh"
#include "fletcher_powell_helix.cuh"
#include "brown_dennis.cuh"
#include "spline_1d.cuh"
#include "spline_2d.cuh"
#include "spline_3d.cuh"
#include "spline_3d_multichannel.cuh"
#include "spline_3d_phase_multichannel.cuh"
#include "saturation_1d.cuh"
#include "rayleigh_1d.cuh"
__device__ void calculate_model(
ModelID const model_id,
REAL const * parameters,
int const n_fits,
int const n_points,
REAL * value,
REAL * derivative,
int const point_index,
int const fit_index,
int const chunk_index,
char * user_info,
int const user_info_size)
{
switch (model_id)
{
case GAUSS_1D:
calculate_gauss1d(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case GAUSS_2D:
calculate_gauss2d(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case GAUSS_2D_ELLIPTIC:
calculate_gauss2delliptic(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case GAUSS_2D_ROTATED:
calculate_gauss2drotated(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case CAUCHY_2D_ELLIPTIC:
calculate_cauchy2delliptic(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
Add a switch case in the CUDA device function calculate_model() in file models.cuh to allow calling the newly added model function.
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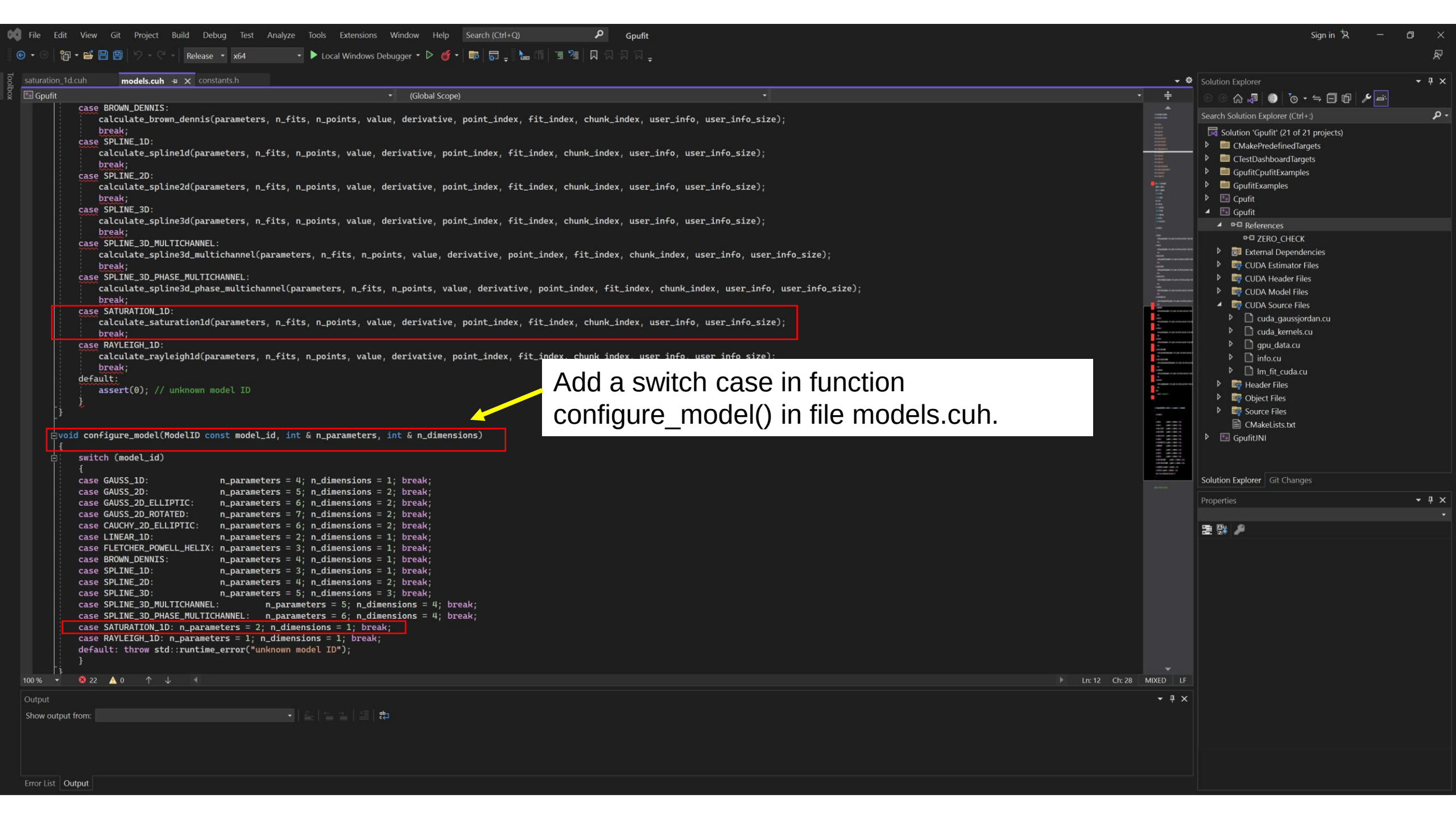
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saturation_1d.cuh
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(Global Scope)
case BROWN_DENNIS:
calculate_brown_dennis(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case SPLINE_1D:
calculate_spline1d(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case SPLINE_2D:
calculate_spline2d(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case SPLINE_3D:
calculate_spline3d(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case SPLINE_3D_MULTICHANNEL:
calculate_spline3d_multichannel(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case SPLINE_3D_PHASE_MULTICHANNEL:
calculate_spline3d_phase_multichannel(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case SATURATION_1D:
calculate_saturation1d(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
case RAYLEIGH_1D:
calculate_rayleigh1d(parameters, n_fits, n_points, value, derivative, point_index, fit_index, chunk_index, user_info, user_info_size);
break;
default:
assert(0); // unknown model ID
}
}
void configure_model(ModelID const model_id, int & n_parameters, int & n_dimensions)
{
switch (model_id)
{
case GAUSS_1D: n_parameters = 4; n_dimensions = 1; break;
case GAUSS_2D: n_parameters = 5; n_dimensions = 2; break;
case GAUSS_2D_ELLIPTIC: n_parameters = 6; n_dimensions = 2; break;
case GAUSS_2D_ROTATED: n_parameters = 7; n_dimensions = 2; break;
case CAUCHY_2D_ELLIPTIC: n_parameters = 6; n_dimensions = 2; break;
case LINEAR_1D: n_parameters = 2; n_dimensions = 1; break;
case FLETCHER_POWELL_HELIX: n_parameters = 3; n_dimensions = 1; break;
case BROWN_DENNIS: n_parameters = 4; n_dimensions = 1; break;
case SPLINE_1D: n_parameters = 3; n_dimensions = 1; break;
case SPLINE_2D: n_parameters = 4; n_dimensions = 2; break;
case SPLINE_3D: n_parameters = 5; n_dimensions = 3; break;
case SPLINE_3D_MULTICHANNEL: n_parameters = 5; n_dimensions = 4; break;
case SPLINE_3D_PHASE_MULTICHANNEL: n_parameters = 6; n_dimensions = 4; break;
case SATURATION_1D: n_parameters = 2; n_dimensions = 1; break;
case RAYLEIGH_1D: n_parameters = 1; n_dimensions = 1; break;
default: throw std::runtime_error("unknown model ID");
}
}
Add a switch case in function configure_model() in file models.cuh.
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22
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Ln: 12
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MIXED
LF
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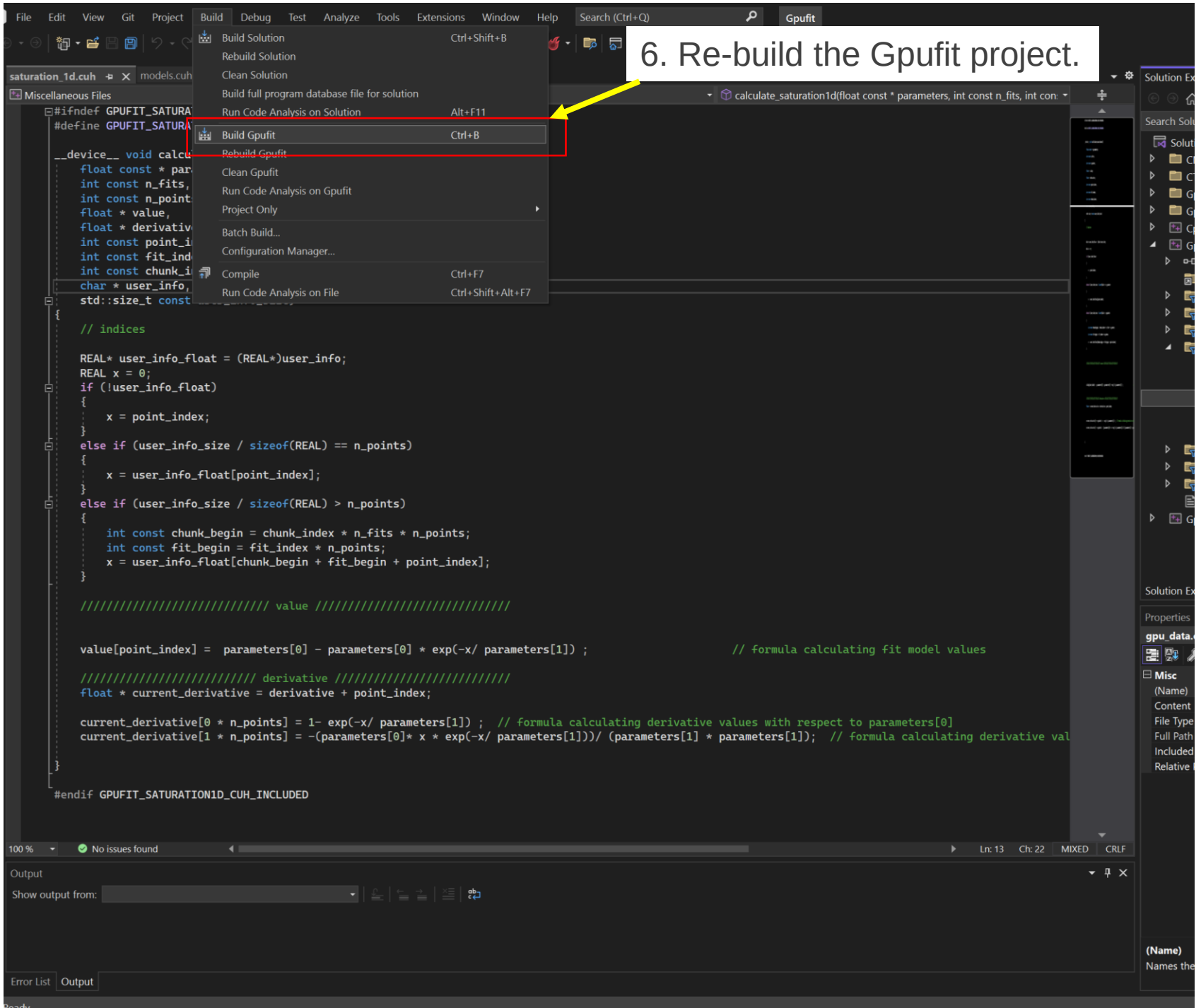
6. Re-build the Gpufit project.
Build Solution Ctrl+Shift+B
Rebuild Solution
Clean Solution
Build full program database file for solution
Run Code Analysis on Solution Alt+F11
Build Gpufit Ctrl+B
Rebuild Gpufit
Clean Gpufit
Run Code Analysis on Gpufit
Project Only
Batch Build...
Configuration Manager...
Compile Ctrl+F7
Run Code Analysis on File Ctrl+Shift+Alt+F7
// indices
REAL* user_info_float = (REAL*)user_info;
REAL x = 0;
if (!user_info_float)
x = point_index;
else if (user_info_size / sizeof(REAL) == n_points)
x = user_info_float[point_index];
else if (user_info_size / sizeof(REAL) > n_points)
int const chunk_begin = chunk_index * n_fits * n_points;
int const fit_begin = fit_index * n_points;
x = user_info_float[chunk_begin + fit_begin + point_index];
////////////////////////// value //////////////////////////
value[point_index] = parameters[0] - parameters[0] * exp(-x/ parameters[1]) ; // formula calculating fit model values
////////////////////////// derivative //////////////////////////
float * current_derivative = derivative + point_index;
current_derivative[0 * n_points] = 1- exp(-x/ parameters[1]) ; // formula calculating derivative values with respect to parameters[0]
current_derivative[1 * n_points] = -(parameters[0]* x * exp(-x/ parameters[1]))/ (parameters[1] * parameters[1]); // formula calculating derivative val
#endif GPUFIT_SATURATION1D_CUH_INCLUDED

VLIV/pygpufit/gpufit.py

Code Blame 323 lines (262 loc) · 13.9 KB Raw

```
39  cuda_available_func = lib.gpufit_cuda_available
40  cuda_available_func.restype = c_int
41  cuda_available_func.argtypes = None
42
43  # gpufit_get_cuda_version function in the dll
44  get_cuda_version_func = lib.gpufit_get_cuda_version
45  get_cuda_version_func.restype = c_int
46  get_cuda_version_func.argtypes = [POINTER(c_int), POINTER(c_int)]
47
48
49  class ModelID:
50      GAUSS_1D = 0
51      GAUSS_2D = 1
52      GAUSS_2D_ELLIPTIC = 2
53      GAUSS_2D_ROTATED = 3
54      CAUCHY_2D_ELLIPTIC = 4
55      LINEAR_1D = 5
56      FLETCHER_POWELL = 6
57      BROWN_DENNIS = 7
58      SPLINE_1D = 8
59      SPLINE_2D = 9
60      SPLINE_3D = 10
61      SPLINE_3D_MULTICHANNEL = 11
62      SPLINE_3D_PHASE_MULTICHANNEL = 12
63      SATURATION_1D = 13
64
65
66  class EstimatorID:
67      LSE = 0
68      MLE = 1
69
```

7. Add the model ID in file gpufit.py

8. Add (1) “Gpufit.dll”
(2) “gpufit.py”
in the location of “Program/VLIV/pygpufit/”.