

DATA INTEGRATION- WEBAPP- RURALGIS

ÉVA NAGYNÉ HAJNAL(PHD, HABIL)

INVESTIGATION OF THE CHARACTERISTICS OF SURFACE SHAPES IN RURAL ENVIRONMENT
BASED ON POINT CLOUDS AND REMOTE SENSING DATA

PROJECT ID: 2019-2.1.11-TÉT-2020-00171

3RD WORKSHOP

06.06.2023 SZÉKESFEHÉRVÁR, HUNGARY



Obuda University, Alba Regia Technical Faculty, Institute of
Science and Software Technology



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Data Sources

- large scale land use maps;
- soil structure data;
- WorldView, RADARSAT, Landsat, Lidar 3D point cloud data;
- relevant Chinese satellite imagery (Sunflower satellite data);
- basic data on the agricultural environment (e.g. land use, topography and other official maps and data related to land), above ground vegetation data (e.g. vegetation index);
- plant phenology data, agricultural surface vegetation data;
- moisture conditions of agricultural land;
- research results, method descriptions (pdf documents);
- Metadata – keywords.



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Main Concept

- Three side of app
 - Data sources
 - Methodology
 - Results
- Authentication and authorization
 - Read descriptions and keywords for guests
 - Modify data, download sources for participants



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Rights management - User groups and rights

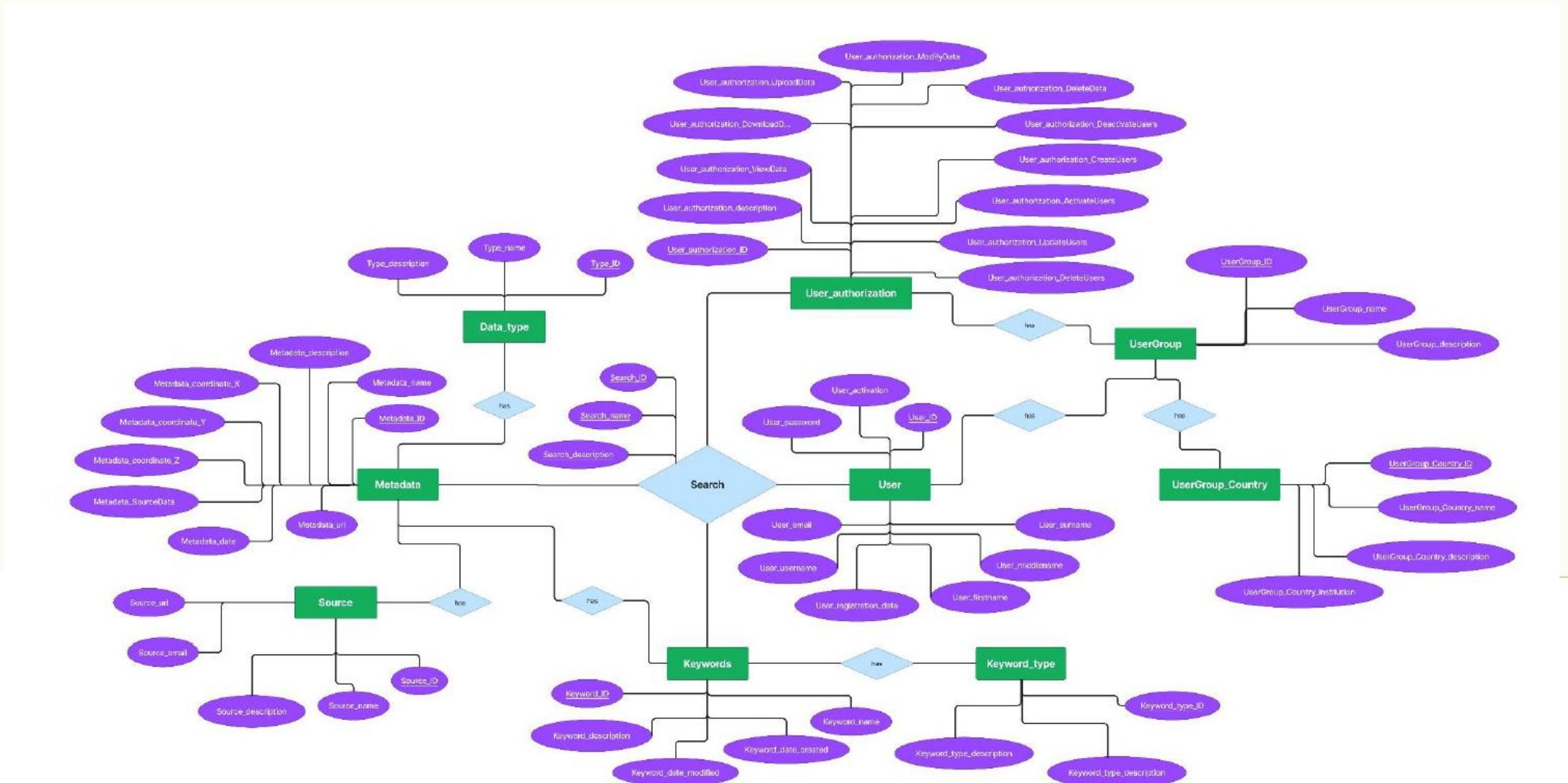
- ID (**User_ID**)
- **User_firstname**, **User_middlename**, **User_surname**
- **User_username**
- **User_password**
- **User_email**
- **User_registration_date**
- **User_activation**
- **User_group**
- Country
- Institution
- **User_group_description**



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ER Model



Rights

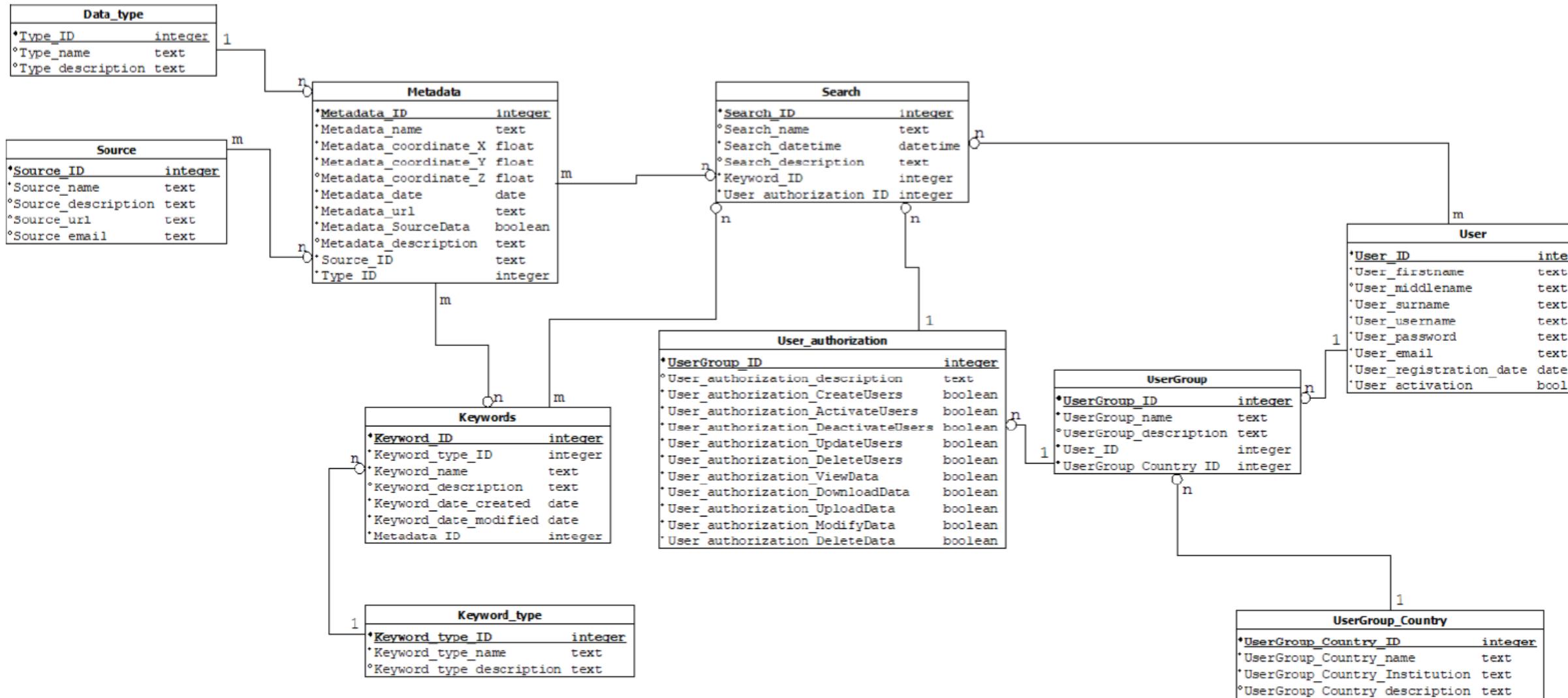
	View Data	Download Data	Upload Data	Modify Data	Delete Data	Create Users	Activate Users	Deactivate Users	Delete Users	Update Users
Admin	X	X	X	X	X	X	X	X	X	X
Guest	X									
Participant	X	X	X	X	X					



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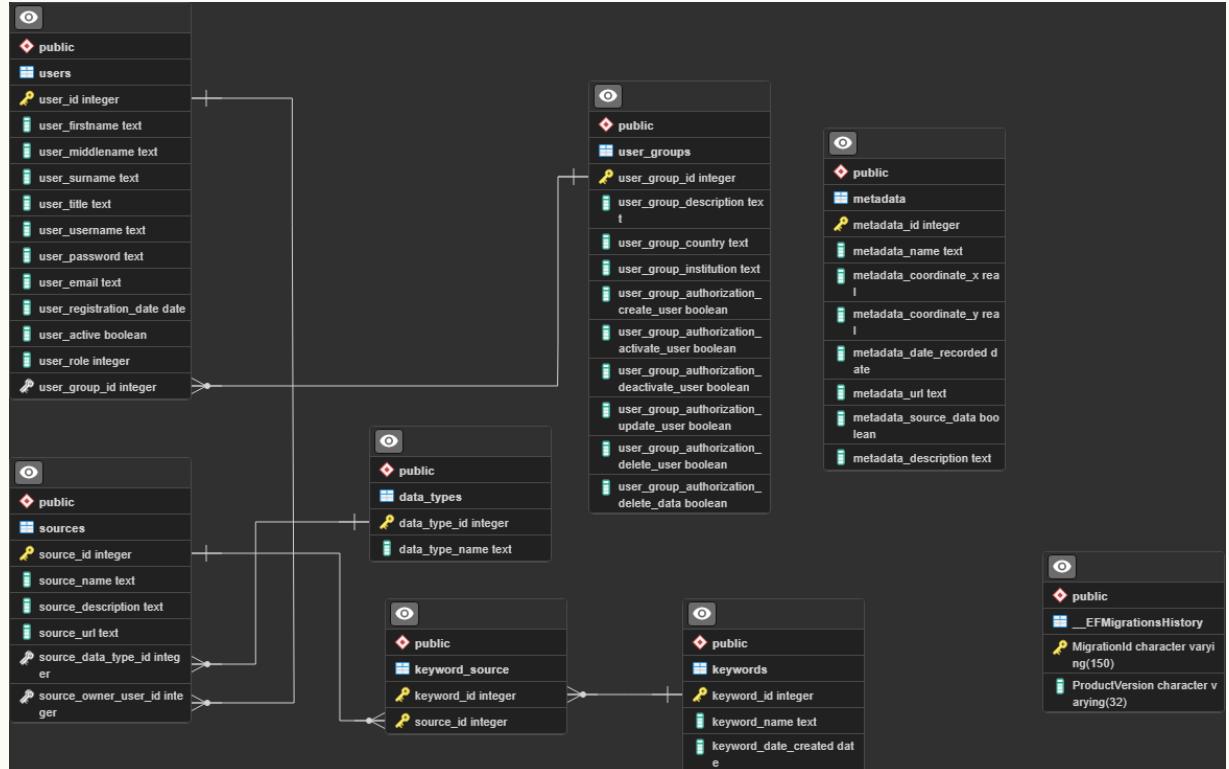
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Relational scheme



Technology - Database

- PostgreSQL 15
 - PostGIS
 - Pgadmin 4
- Advantage: SQL queries of GIS data



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Dynamic Database Changes ✓

- ORM methodology
- Entity Framework Core 7.0
- Easy to modify database for the new requirements
- Code first method create the object side and migrates the changes

```
1  namespace RuralGIS.Data
2  {
3      [Table("data_types")]
4      public class DataType
5      {
6          // Primary data, Method, Result
7
8          /// <summary>
9          /// Unique identifier for data type, primary key.
10         /// </summary>
11         [Key]
12         [Column("data_type_id")]
13         [Comment("Unique identifier for data type, primary key.")]
14         public int Id { get; set; }
15         /// <summary>
16         /// Name of the data type.
17         /// </summary>
18         [Column("data_type_name")]
19         [Comment("Name of the data type.")]
20         public string Name { get; set; }
21     }
22 }
```

Asp.net Core WEBAPI Technology ✓

- LINQ queries – high abstraction level database technology
- JSON communication
- Data annotations for safety
- Authorization

```
1 var builder = WebApplication.CreateBuilder(args);
2
3 // Add services to the container.
4 builder.Services.AddDbContext<DataContext>(
5     o => o.UseNpgsql(builder.Configuration.GetConnectionString("Database")));
6
7 // JWT authentication
8 builder.Services.AddAuthentication(JwtBearerDefaults.AuthenticationScheme)
9     .AddJwtBearer(options =>
10 {
11     options.TokenValidationParameters = new TokenValidationParameters
12     {
13         ValidateIssuer = true,
14         ValidateAudience = true,
15         ValidateLifetime = true,
16         ValidateIssuerSigningKey = true,
17         ValidIssuer = builder.Configuration["Jwt:Issuer"],
18         ValidAudience = builder.Configuration["Jwt:Audience"],
19         IssuerSigningKey = new SymmetricSecurityKey(Encoding.UTF8.GetBytes(builder.Configuration["Jwt:Key"]))
20     };
21
22     options.Events = new JwtBearerEvents()
23     {
24         OnMessageReceived = context =>
25         {
26             var accessCookie = context.Request.Cookies["JWT"];
27
28             // Authorization fails if client doesn't have the cookie
29             if (accessCookie == null)
30                 context.Fail("Unauthorized");
31
32             // Authorization fails if user doesn't exist
33             WebHost.CreateDefaultBuilder(args)
34                 .UseStartup<DelegateStartup>()
35                 .UseKestrel(opt => {
36                     var sp = opt.ApplicationServices;
37                     using (var scope = sp.CreateScope())
38                     {
39                         var db = scope.ServiceProvider.GetService<DataContext>();
40                         var identity = context.HttpContext.User.Identity as ClaimsIdentity;
41
42                         if (identity == null)
43                             context.Fail("Unauthorized");
44
45                         var idClaim = identity.Claims.FirstOrDefault(claim => claim.Type == ClaimTypes.SerialNumber)?.Value;
46
47                         if (idClaim == null)
48                             context.Fail("Unauthorized");
49
50                         var user = db.Users.FirstOrDefault(u => u.Id.ToString() == idClaim);
51
52                         if (user == null)
53                             context.Fail("Unauthorized");
54
55                         context.HttpContext.User = new ClaimsPrincipal(new ClaimsIdentity(new[] { new Claim(ClaimTypes.SerialNumber, user.Id.ToString()) }, "JWT"));
56                     }
57                 });
58             };
59         };
60     };
61 });
62
63 // Configure the HTTP request pipeline.
64 app.UseHttpsRedirection();
65 app.UseAuthorization();
66 app.MapControllers();
67
68 app.Run();
```

RuralGIS – Testing ✓

- Backend is ready
- Testing is independently from frontend with Swagger technology
- Execution in Docker container

The screenshot shows the 'DataUpload' API endpoint for a 'POST /upload/result' request. The 'Parameters' section includes:

- Title** (required string): 'Classification Methods to Detect the Growth of Industrial Areas'
- Description** (string): 'The incorporation of agricultural areas is an increasing problem.'
- OwnerUsername** (required string): 'Admin'
- Keywords** (array): 'remote sensing', 'Image classification', 'environmental analysis', 'GIS'
- File** (string(\$binary)): A file named 'Paper_T_Jancso_Podor_A_.ajhal_E_AIS2022_.pdf' is selected.

The 'Responses' section displays the curl command and the server response:

```
curl -X "POST" \
  "https://localhost:7046/upload/result" \
  -H "accept: */*" \
  -H "Content-Type: multipart/form-data" \
  -F "Title=Classification Methods to Detect the Growth of Industrial Areas" \
  -F "Description=The incorporation of agricultural areas is an increasing problem. During the construction, we can typically observe the expansion of industrial parks, logistics centers or the co" \
  -F "OwnerUsername=Admin" \
  -F "Keywords=remote sensing" \
  -F "Keywords=Image classification" \
  -F "Keywords=environmental analysis" \
  -F "Keywords=GIS" \
  -F "file=@Paper_T_Jancso_Podor_A_.ajhal_E_AIS2022_.pdf;type=application/pdf"
```

Server response:

Code	Details
201	Response body

```
{"id": 4, "name": "Image Classification Methods to Detect the Growth of Industrial Areas", "description": "The incorporation of agricultural areas is an increasing problem. During the construction, we can typically observe the expansion of industrial parks, logistics centers or the co", "owner": {"id": 1, "username": "Admin"}, "keywords": [{"id": 1, "name": "remote sensing"}, {"id": 2, "name": "Image classification"}, {"id": 3, "name": "environmental analysis"}, {"id": 4, "name": "GIS"}]}
```

RuralGIS Frontend



- Style
- Technology
 - React JS frontend

The screenshot shows a website header with a blue arrow logo on the left, the text "RuralGIS Frontend" in the center, and a yellow hourglass icon on the right. The main content area has a dark blue background with white text. At the top left is a logo of a globe with "TéT" on it. At the top right are navigation links: HOME (underlined), BASIC INFORMATION, RESEARCH PLAN, PUBLICATIONS, and WORKSHOPS. In the center, the text reads: "Investigation of the characteristics of surface shapes in rural environment based on point clouds and remote sensing data". At the bottom left is the logo of the Aerospace Information Research Institute, Chinese Academy of Sciences. At the bottom right is the logo of ÓBUDA UNIVERSITY ALBA REGIA TECHNICAL FACULTY. To the right of the text area is a satellite map of Europe.

Aerospace Information Research Institute
Chinese Academy of Sciences

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THANK YOU FOR YOUR ATTENTION!

Éva Hajnal (PhD, Habil)
Hajnal.eva@amk.uni-obuda.hu

Obuda University, Alba Regia Technical Faculty, Institute of Science and Software Technology

www.amk.uni-obuda.hu



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