

Name and surname:	Grzegorz Jóźków
Academic Degree:	dr hab. inż. (DSc.)
Institute/Department:	Institute of Geodesy and Geoinformatics
e-mail address:	grzegorz.jozkow@upwr.edu.pl
ORCID:	0000-0003-4953-9253
UPWr Base of Knowledge - link:	https://bazawiedzy.upwr.edu.pl/info/author/UPWr3719fc45efdc4a24ae17f595857b47a9?r=author&tab=&title=Profil%2Bosoby%2B%25E2%2580%2593%2BGrzegorz%2BJ%25C3%25B3%25C5%25BAk%25C3%25B3w%2B%25E2%2580%2593%2BUniwersytet%2BPrzyrodniczy%2Bwe%2BWroc%25C5%2582awiu&lang=pl
Researchgate:	
Personal website / Working group website:	
Participation in projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):	GATHERS (RF); EPOS-PL+ (RF); Wateragri (RF); EPOS-PL (RF)
Do you plan to engage support of second supervisor or auxiliary supervisor?	YES
	Auxiliary supervisor
Name and surname:	Maya Blagoeva Ilieva
Academic Degree:	dr (Dr.)
Faculty, Institute/Department:	Institute of Geodesy and Geoinformatics
e-mail address:	maya.ilieva@upwr.edu.pl
ORCID:	0000-0002-9443-2175
UPWr Base of Knowledge - link or most important publications from last 3 year (JCR) / patents from last 3 years (maximum 5):	https://bazawiedzy.upwr.edu.pl/info/author/UPWreeb494a455174876b392e94cd290405d?r=author&tab=&title=Profil%2Bosoby%2B%25E2%2580%2593%2BMaya%2BBlagoeva%2BIlieva%2B%25E2%2580%2593%2BUniwersytet%2BPrzyrodniczy%2Bwe%2BWroc%25C5%2582awiu&lang=pl&qp=
Researchgate:	
Personal website / Working group website:	
Projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):	GATHERS (PI); OPUS 21: Badania procesu wyzwalania wstrząsów przez sztuczne zbiorniki wodne przy pomocy identyfikacji skupisk oraz technik uczenia maszynowego (RF); EPOS-PL+ (RF); EPOS-PL (RF); SatWebMare - Satellite-based Maritime Web-services for Bulgarian coastal area (RF)
PhD topic:	Crop monitoring by integration of high-resolution remote sensing data for smart farming and environmental management
Research discipline in Doctoral School:	Civil Engineering, Geodesy and Transport

<p>Short description of the research problem to be solved in the PhD (minimum 1000 characters):</p>	<p>Remote sensing supports environmental applications in many aspects. One of them is vegetation monitoring, including crops. In this field remote sensing data can be used for many purposes, for example, plant growth, determination of phenological phases, health condition or even habitat parameters. All these parameters are important in the crop production process. The literature shows many examples of the use of different kinds of remote sensing data (from terrestrial to satellite) for crop plant monitoring. Each used data has its advantages and limitations. For example, satellite spectral data (images) has relatively good spatial resolution and can easily show areas where the plants grow in different manner – very often spectral indices, such as Normalized Differential Vegetation Index (NDVI) reflecting the chlorophyll content is used for this purpose. However, satellite spectral data is limited by the weather, especially clouds because they are not transparent to visible and infrared wavelengths. From the other hand, satellite SAR (Synthetic Aperture Radar) data is not limited by the weather, but it has worse spatial resolution and is less suitable for the vegetation monitoring purposes, however, the change in SAR images show some correlation to the change of the crop height (partially related to phenological phases). Beside the satellite data, crop plants can be monitored with the use of the remote sensing data collected with the aircrafts, in particular UAVs (Unmanned Aerial Vehicles) which are less expensive and easier to use than manned airborne platforms. The UAV remote sensing data may be of extremely high resolution reaching millimeter resolution in the case of RGB images and is not limited by the clouds, though the rain and wind may prevent the flights and the size of the mapped area is smaller. In addition, the frequency of data acquisition cannot be so high as for some satellite constellations. Typical sensors used with UAVs are cameras (RGB, multispectral, thermal), but there are also laser scanners that can produce very dense and accurate 3D geometrical data in the form of a point cloud that is impossible to collect with satellite sensors. The point cloud density or other geometrical features of the points may also show different properties of crop plants.</p> <p>The scientific problem that needs to be solved in this PhD project is the development of the method that integrate different types of high resolution remote sensing data and allows to estimate crop plant parameters that help in the precise farming. For that reason, the focus of the experiments is on the small areas but with high spatial resolution. It is expected that the joint use of different kinds of data will increase the accuracy in comparison to a single data type. It is planned to use satellite data that are free of charge and collect UAV data with the equipment available in IGiG (Institute of Geodesy and Geoinformatics). The specific parameters of the crop plant that are of the high interest in the precise farming will be defined by the consultation with the experts in the precise farming.</p>
<p>Professional skills for PhD candidate (e.g. master program, specializations, softwares, language, analytical techniques, minimum 500 characters):</p>	<p>MSc in the field of geodesy and cartography, geoinformatics, or related to remote sensing discipline. Knowledge of: photogrammetry, laser scanning technology, satellite remote sensing (both radar and spectral), UAV mapping, GIS, agriculture (basics). Knowledge of the UAV photogrammetry software, point cloud processing software(e.g. CloudCompare), GIS software (e.g. QGIS), SAR data processing software (e.g. SNAP), basic programming skills (e.g. Python, R). Recommended experience in the use of UAV and remote sensing data for plant monitoring. Good English language skills: speaking, scientific text reading, technical text writing. Motivation to publish results of the research in scientific journals.</p>
<p>a) Project title:</p>	<p>0</p>
<p>b) Agreement number:</p>	<p>0</p>
<p>c) Number of months in the project to support PhD student (in months; starting from 1st of October 2024):</p>	<p>0</p>
<p>Project website:</p>	<p></p>