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<b>UPWr Base of Knowledge - link:</b>	<a href="https://bazawiedzy.upwr.edu.pl/info.seam?id=UPWr3719fc45efdc4a24ae17f595857b47a9&amp;lang=en">https://bazawiedzy.upwr.edu.pl/info.seam?id=UPWr3719fc45efdc4a24ae17f595857b47a9&amp;lang=en</a>
<b>Participation in projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):</b>	EPOS-PL (RF), GATHERS (RF), Wateragri (RF), EPOS-PL+ (RF)
	Auxiliary supervisor
<b>Name and surname:</b>	Maya Blagoeva Ilieva
<b>Academic Degree:</b>	dr inż. (Dr. Eng.)
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<b>UPWr Base of Knowledge - link or most important publications from last 3 year (JCR) / patents from last 3 years (maximum 5):</b>	<a href="https://bazawiedzy.upwr.edu.pl/info.seam?id=UPWreeb494a455174876b392e94cd290405d&amp;lang=en">https://bazawiedzy.upwr.edu.pl/info.seam?id=UPWreeb494a455174876b392e94cd290405d&amp;lang=en</a>
<b>Projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):</b>	SatWebMare – Satellite-based Maritime Web-services for Bulgarian coastal area (RF), EPOS-PL (RF), GATHERS (PI), EPOS-PL+ (RF), OPUS 21: Badania procesu wyzwalania wstrząsów przez sztuczne zbiorniki wodne przy pomocy identyfikacji skupisk oraz technik uczenia maszynowego (RF).
<b>PhD topic:</b>	Determination of phenological phases of selected plants based on satellite and UAV remote sensing data.
<b>Research discipline in Doctoral School:</b>	Civil Engineering, Geodesy and Transport
<b>Short description of the research problem to be solved in the PhD (minimum 1000 characters):</b>	<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, determination of phenological phases which 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) to estimate phenological phases. Each used data has its advantages and limitations. For example, satellite spectral data (images) has relatively good spatial resolution and can easily show changes between phenological phases in which plants contain different amounts of chlorophyll. However, spectral data is limited by the weather, especially clouds because they are not transparent to visible and infrared wavelengths. In addition, the satellite revisit time may not fit into a good weather window to collect appropriate data. 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, phenological phases can be determined from 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 RGB and spectral cameras, 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 change in the point cloud density may also indicate the change in the phenological phase of the crop.</p> <p>The scientific problem that needs to be solved in this PhD project is the joint use of different kinds of satellite and UAV remote sensing data for determining the phenological phases of selected crop (crops). 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 mainly satellite data that are free of charge and collect UAV data with the equipment available in IGIG (Institute of Geodesy and Geoinformatics). The reference data about the phenological phase will be collected in the field.</p>
<b>Professional skills for PhD candidate (e.g. master program, specializations, softwares, language, analytical techniques, minimum 500 characters):</b>	<p>MSc in the field of geodesy and cartography, geoinformatics, or related to remote sensing discipline. Knowledge of: satellite remote sensing (both radar and spectral), laser scanning technology, GIS, agriculture (basic). Knowledge of the GIS software (e.g. ArcGIS, QGIS), SAR data processing software (e.g. SNAP), point cloud processing software (e.g. CloudCompare), basic programming skills (e.g. Python, R). Recommended experience in the use of remote sensing data for crop phenotyping. Good English language skills: speaking, scientific text reading, technical text writing. Motivation to publish results of the research in scientific journals.</p>
<b>a) Project title:</b>	0
<b>b) Agreement number:</b>	0
<b>c) Number of months in the project to support PhD (in months; starting from 1st of October 2022):</b>	0
<b>Project website:</b>	