FabSpaces at ImageCLEF 2017 - Population Estimation (Remote) Task

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Abstract. The paper summarizes the participation of the 6 FabSpaces to the population estimation (remote) pilot task at ImageCLEF 2017 Lab. FabSpace 2.0 is an open-innovation network for geodata-driven innovation that aims at improving universities contribution to the socio-economic and environmental performance of societies. In the framework of the ImageCLEF Lab, the 6 FabSpaces participated although only four of them succeeded in submitting a run. This paper summarizes their participations. For each FabSpace, we present the local organization to participate to the CLEF Lab, the participants and their work. We conclude this paper with some lessons we learned from this participation.

1 Introduction

FabSpace 2.0 is the open-innovation network for geodata-driven innovation by leveraging Space data in particular, in Universities 2.0. FabSpace 2.0 received funding from the European Unions Horizon 2020 Research and Innovation programme under the Grant Agreement n°693210. The FabSpace 2.0 project aims at making universities open innovation centres for their region and at improving their contribution to the socio-economic and environmental performance of societies [2].

Within this project, we have set up 6 local FabSpace laboratories which are one-stop shops with access to a range of data (including space data), free software and data processing tools, to develop new applications. FabSpace also provides a new free-access service and place dedicated to collaborative data-driven innovation in 6 European universities. Each local FabSpace provides students, researchers, entrepreneurs-to-be and citizens with access to geodata, applications, software and challenges in order to design and test their own applications.

Within CLEF 2007, each local FabSpace organised locally their teams in order to try to answer the population estimation (remote) task as defined in [1] and which is part of the ImageCLEF Lab [5] at CLEF 2017[6]. Details are provided in the next sub-sections.

2 Greek FabSpace at CLEF 2017

2.1 Presentation

The Greek FabSpace is operated by ICCS and Corallia, which are the academic and business partners. The ICCS (Institute of Communications and Computer Systems) is a non-profit Academic Research Foundation, founded in 1989 by the Ministry of Education, with a view to conducting research and development activities in collaboration with the School of Electrical and Computer Engineering of the National Technical University of Athens. Corallia works in the field of cohesive and productive innovative ecosystems within which actors operate in a coordinated manner, in specific sectors and regions of the country, and where a competitive advantage and export orientation exists. In those clusters, Corallia acts as a cluster facilitator. Corallia has already developed and currently supports the growth of three highly-specialised cluster initiatives in Greece, in knowledge-intensive thematic sectors. Both entities are also the leading partners in the Copernicus Uptake Networks, Copernicus Academy Network in Greece (GR-CAN) and Copernicus Relay Network in Greece (GR-CRN) respectively.

The Greek FabSpace Lab is located in the Microprocessors and Digital Systems Lab (microlab) in the National Technical University of Athens.

2.2 Local Organization

Corallia, with the support of ICCS and a number of companies, ESA and Copernicus Relay and Academy in Greece, have organized the FabSpace HackOnEarth, in order to promote the FabSpace 2.0 project, the FabSpace challenges and the CLEF challenge. This event was an open innovation contest, with main objective the creation of new applications, services, platforms, technologies and innovative solutions for non-space markets like precision agriculture and smart cities. This objective was fulfilled by using geo-data and geo-information, and by exploiting the infrastructure of the FabSpace lab. The applicants could select freely one or more challenges set by HackOnEarth, and they could have the assistance of experts to create their own product, solution, application and business concept, during a 24-hour contest.

Local Teams Prior to the HackOnEarth event dates, the interest was already high. About 12 teams were registered initially for all the challenges, 2 of them specifically for the CLEF contest. Each team consisted in 2 to 5 persons, and it has been recommended to include people with different background (i.e. earth observation specialists, electrical or mechanical engineers, business oriented people, etc.). Indeed, this interdisciplinarity is an essential part of the FabSpace project. During the contest, eight teams have finally started, while the two teams originally selected to compete for the CLEF challenge, have merged as they considered it important for the better elaboration of their ideas. It is considered that a larger number of participants could have been registered for the CLEF challenge, if some of the requirements were more relaxed or the time availability was larger. Additionally a good knowledge of the Earth Observation techniques, although not necessary to participate in the contest, was deemed recommended, therefore limiting the number of potential candidates.

Local Criteria For all the proposed concepts in the HackOnEarth similar business/ innovation criteria have been used to select the winners. This was true also for the ideas related with the CLEF contest, since one of the main objectives of the FabSpace 2.0 is to promote the use of earth observation (EO) for the creation of new start-ups.

The overall criteria were:

1. Innovation of the proposed concept,
2. Technological approach of the proposed solution,
3. Potential for commercialization,
4. Team quality,
5. Maturity of the concept in order to become faster a final product.

The accuracy and technological excellence of the proposed solution for the CLEF challenge have been also taken into account. To this end the criteria of the CLEF call have been additionally used (see [1]).

2.3 Participants and results

Regarding the Greek local winner, their solution is briefly summarized here, however a more detailed analysis can be found in [7]. More specifically, in order to achieve a population estimation of the areas of West Uganda and Zambia, the Greek team "Grapes" used Sentinel 2 satellite images coupled with a statistical analysis procedure based on historical census data. A supervised classification of images was used where the living areas of an image are extracted onto a high resolution pixelated output. The population of the classified study areas have been estimated by specifying a weight variable representing the density multiplier for each pixel that represents living areas. Its value varies for different areas and has been estimated using a statistical study on historical data including a regression and a forecasting model. Table 1 shows the results of the aforementioned estimation.

3 Italian FabSpace at CLEF 2017

3.1 Presentation

The FabSpace 2.0 project is managed in Italy by the University of Rome Tor Vergata and the Business Innovation Centre of Lazio Region (BIC Lazio). A

Table 1. Population estimation from FabSpace Greece. UGD stands for Uganda while ZMB is for Zambia region. Overall is when considering both regions all together. The details of the measures and results can be found in the overview of the task.

Participant	Geographic Zone	Sum Delta	RMSE	Pearson	AvgRelDelta
Grapes	UGD	10,160	770	**0.95**	38.75
Grapes	ZMB	1,476,753	38,072	0.25	209.87
Grapes	Overall	1,486,913	34,290	0.33	177.55

dedicated infrastructure has been already set-up to support on a daily basis new users to understand and analyse EO data, with a particular emphasis on Copernicus data. Various animation events, such round tables, open-days, hackatons, bootcamps are organized within the project. Among them, specific attention is devoted to the launch of challenges involving the use of satellite images and of open geographic data.

3.2 Local organization

The CLEF challenge has been organized jointly by University of Rome "Tor Vergata" and BIC Lazio. It has been promoted through the FabSpace network of registered users, through the institutional website of the Regione Lazio. The announcement has been also included in the newsletter of the BICs Holding company Lazio Innova. Moreover various oral announcements to students have been made during lectures held at Tor Vergata University. A continuous support has been provided to all possible participants or interested people by the Tor Vergata FabSpace team.

Local teams The local organizing team consists primarily of the FabSpace Managers, but also other Tor Vergata personnel involved in the FabSpace project (so far 2 professors, 2 technicians, 3 researchers) and of some additional professors and researchers who provided their feedback, either in terms of methodology or accuracy, about the delivered results. In particular an evaluation board of three experts has been formed for the selection of the winner. Participating teams are presented later in this section.

Local criteria The evaluation was partially based on the methodology used by the participants (50% weighting factor). The board examined the procedure and evaluated it according to the following criteria:

- level of exploitation of Earth observation data,
- level of automation, and
- generalization capability in other regions.

The assessment was also based on the comparison between estimates and ground truth (50% weighting factor). Either for the city of Lusaka or for West Uganda auxiliary data could be used. They are based on estimates that uses a combination of voluntary geographical information (VGIs) working on BING (2012) images with further earthwork. Both were provided by NGOs. In addition, accuracy was evaluated using CLEF pilot task criteria [1].

3.3 Participants and Results

Although various groups of people expressed their interest to participate to the challenge, only two teams worked effectively on it. The first one derives from one of the companies incubated in the BIC Lazio offices, in the other one, two University of Tor Vergata students, one from Management Engineering, the other from the Computer Science Engineering combined their different skills to face with the challenge. Only this second team delivered a final result in the end.

Participants and Approaches The work submitted by the participating team was based on the two areas centred on the Lusaka city in Zambia and on a rural area in Uganda. The participants chose to use the satellite imagery from Sentinel-2 mission, in particular the 10 meters resolution RGB and Near-infrared bands were used. This choice was made because of the highest resolution respect to other bands. Available open data providing unprecedented fine scale of 250 m maps quantifying population starting from detection and density of built-up structures have been considered[3]. In this case, the image processing technology exploits structure (texture, morphology, and pattern) as key information. Population estimates were produced and made available for processing by the Center for International Earth Science Information Network (CIESIN). Such an information is available for 241 country based layers. In order to use it in this work the following steps were achieved:

1. The LDS images are re-projected in the same reference system (UTM 35-South) of Sentinel-2 imagery
2. The image is resampled to fit the same pixel size dimension of Sentinel-2 imagery
3. Each pixel has 10x10 meters of resolution, but the value is still related to an area of 250x250 meters. To correct this problem, an initial redistribution operation is applied following this equation:

$$p_{i,j}^{10x10} = \frac{p^{250x250}}{n}; \, i = 1, \ldots 25; \, j = 1, \ldots 25; \, n = 25 \cdot 25 \qquad (1)$$

where $p_{i,j}^{10x10}$ is the pixel value in the new resampled image, obtained in the 2.) step, and $p^{250x250}$ is the pixel value in original LDS imagery, with:

$$\sum_{i=1}^{25} \sum_{j=1}^{25} p_{i,j}^{10x10} = p^{250x250} \qquad (2)$$

The equation (1) is performed for each pixel in original LDS imagery.

The method described assumes that the relationship between pixels 4 reflectances and the population is non-linear. To approximate this relationship a CNN is defined, it takes in input the pixels values (RGB and near infrared) and returns the population [4]. The CNN is composed of two convolutional layers [8] with kernel size of 2 and 64 feature maps with strides equal to 1 and a ReLU activation function. Each convolutional layer is followed by a batch normalization layer. The final layers are fully connected; the first one has 128 ReLU neurons and the last one has only a neuron with linear activation function. The estimation of the population at the finer scale is performed by a procedure which redistributes the population within each pixel at higher resolution keeping the total given by the pixel at 250 m resolution.

The output of this process is a new image representing the population for each pixel, also the geographic reference from the input is reused for the output. Each area of interest is represented by a shape file, to extract the population of each area, a QGIS procedure importing the shape file and the output image from the CNN has been used.

Results The model was tested using the ImageCLEF 2017 validation system. The following result are obtained:

Table 2. Details of the other numerical features

Studied Area	Sum deltas	RMSE	Pearson
UGD	18,485	1,817	0.76
ZMB	1,465,603	30,480	0.08

3.4 Discussion

Looking at the Pearson coefficient in the table above, our model seems to perform better in rural area (UGD) than Lusaka city (ZMB). A possible reason why we have obtained this difference could be found in the better initial estimation in LDS ground truth for UGD respect the ZMB area. However, in general, the method proposed by the team is characterized by a very high level of automation and makes a smart usage of open geographic data, which are considered for training the CNN, showing an interesting way to enhance the information contained in the EO data. Our conclusion is that the method is definitely promising because it effectively combines the potential higher spatial resolution of Sentinel satellite imagery with already world-wide available open data at coarser resolution.

4 German FabSPace at CLEF 2017

4.1 Presentation

The German FabSpace is running by the strong collaboration between the academic partner Institute of Geodesy, Technical University of Darmstadt and the business partner ESA Business Incubation Center (ESA-BIC) managed by cesah GmbH. The physical lab is located at the Institute of Geodesy, Technical University of Darmstadt and dealing all the technological aspects of practicing earth observation science in the laboratory. The business section and all the entrepreneurial activity is dealing by the Business Incubation Center cesah GmbH.

The Institute of Geodesy represents the teaching and research in the area of Geodesy and Geo-information at the Technical University of Darmstadt. In the course of a re-organization in the year 2012 the following sections have joined to form the institute : Remote Sensing and Image Analysis (with a focus on remote sensing, photogrammetry and image analysis), Geodetic Measuring Systems and Sensor Technology (with a focus on measuring systems, sensor technology, surveying engineering), Land Management (with a focus on land management, real estate regulations and economy, and urban planning), Physical and Satellite Geodesy (with a focus on physical geodesy, reference systems, satellite geodesy and navigation).

The Center for Satellite Navigation Hessen (cesah) is a competence, information, and start-up center for satellite navigation and is supported by the State of Hesse, Darmstadt as well as renowned industrial and research facilities. On behalf of ESA, cesah runs the ESA Business Incubation Center (ESA BIC) Darmstadt and supports young companies and start-ups in the technical development, implementation and launch of new products and services related to satellite navigation. Moreover, the organization is promoting satellite navigation and earth observation in a digital world. The ESA BIC precisely supporting on how satellite navigation, earth observation, geo-information, telecommunication and more can be used for a variety of new applications and products development. In close co-operation and with technical and financial support from ESA, cesah is giving the necessary assistance for start-up creation.

4.2 Local organisation

Regarding the ImageCLEF population estimation (remote) 2017 local contest, both the academic and business partners spread the word in the news media. A poster has been created to attract the participants and also several news has been published in different electronic media (i.e. Facebook, Twitter, LinkedIn etc.). Most importantly a website [1] has been created for the subscription from the participants for the ImageCLEF 2017 population estimation (remote) pilot task. The local task was organized at the FabSpace Laboratory at Technical University of Darmstadt as an open competition where all the FabSpace core member were

[1] https://www.fabspace-germany.de/clef/index.html

strongly involved to guide the methodology and draw the technology driven results. The best team of three members has been selected and one of them has been awarded as a trip to Dublin for the ImageCLEF 2017 conference. The winner has been received the prize sponsored by a promising company named Telespazio Vega at Darmstadt, Germany.

At the beginning, the team was selected according to 1) the ability of image processing, 2) the experience of working with Earth Observation data, 3) the software knowledge of objective based image processing. After selecting the best team, the next stage was to select the winner according to 1) the accuracy of image processing and population estimation (based on the initial ground truth set from the secondary sources), 2) the diverse methodology used to solve the challenge, 3) the implication of software and tools.

4.3 Participants and Results

Participants and Approaches According to the registration process of ImageCLEF population estimation (remote) 2017 [5] and getting data sets, a group of 3 participants has been portrayed some results. All the three participants were approached through different methodologies according to their point of view. The task is guided by the use of optical satellite imagery (i.e. Sentinel-2) but one participant of the group has also investigated the potentials of radar imagery (i.e. Sentinel-1) to draw best result. The Darmstadt core team was also involve in the analysis process to ensure best results.

To estimate the population, participants used the provided bands of Sentinel-2 images as visual bands 2,3,4 (VIS) and 8 (NIR) to create a stacked image [1]. Afterwards a supervised classification was carried out using the Semi-Automatic Classification Plugin (SCP) in QGIS. Among the participants one participant used Minimum Distance and Maximum Likelihood algorithms. Another participant used other methods of data analysis performed by K-Means Cluster Analysis as unsupervised land classification and Maximum Likelihood Classification as supervised land classification. Both the analysis was performed by SNAP (Sentinel Application Platform) version 5 provided by European Space Agency - ESA. The K-Means Cluster Analysis was performed by using Near Infrared band for both study area and the Maximum Likelihood Classification was performed by using false color composite map (i.e. Red, Green, Blue, and Near Infrared bands stack image) and also by using only Near Infrared band for both the study area. The K-Means Cluster Analysis as unsupervised land classification was performed based on 5, 11 and 15 clusters where within 11 clusters the lands are identical. The Maximum Likelihood Classification as supervised land classification was performed with 4 different types of supervised land classes (Built-Up areas, Vegetation, Waterbody and Cloud) for the city of Lusaka and 3 different types of supervised land classes for west Uganda (excluding Cloud). The supervised land classes are based on 75 identical training sites. The identification of training sites is based on ESRI base map, false color composite map (Red, Green, Blue and Near Infrared band), and Near Infrared band. On the other hand, the use of Sentinel-1 SAR image stack is widely useful for urban and non-urban mapping through supervised and/or unsupervised classification. One participant was worked on the radar image acquired in the season when there is less vegetation in the study area thus the backscattering coefficient in vegetated areas is less high, which makes the distinction from urban areas (high backscattering) easier. Moreover, the participant was also worked with one ascending and one descending image in order to diminish radar image distortions. The acquired imagery was step by step processed in the SNAP environment. The processing steps includes: Thermal Noise Removal, Apply Orbit File, Calibration to Beta0, Speckle filtering, Radiometric terrain flattening, Range Doppler Terrain Correction to draw the result.

Results The calculation process includes several runs which was validated according to the ImageCLEF population estimation (remote) 2017 evaluation criteria [1] and the best evaluation statistics are presented in the table bellow. The 1st run is the official one while the Final run results from developments made after the official submission.

Table 3. Details of the classifications results (German FabSpace)

Population			
Study Area	**Sum Delta**	**RMSE**	**Pearson**
1st Run			
Uganda	19	2,199	0.87
Zambia	68	30,510	0.11
Final Run			
Uganda	19	2,199	0.87
Zambia	34	15,505	0.81

House Count			
Study Area	**Sum Delta**	**RMSE**	**Pearson**
1st Run			
Uganda	24	638	0.87
Zambia	76	6,055	0.11
Final Run			
Uganda	24	638	0.87
Zambia	34	3,073	0.81

4.4 Discussion

The participants and the FabSpace Darmstadt core team had an interactive work flow to reach the goal with good accuracy. The team has found that the fusion of supervised and unsupervised classification is a promising way of achieving good results as the households and built-up areas are not uniform. The team has a great findings of heterogeneous reflectance from diverse land cover whereas, the building rooftop, road and bare soil has similar reflectance as the construction materials are almost same for those infrastructures. Thus, it is also a productive idea of fusing optical and radar image based classification to achieve better result. Therefore, the first run has a moderately poor result than the final run which is an addition of different methods and shift of parameters. However, the constrains of reaching good classification results for Lusaka was the diverse structures and the mixture of settlements, commercial areas and vegetation. On the other hand, selected areas of Uganda are in rural areas where there is less population density with few settlements.

5 Polish FabSpace at CLEF 2017

5.1 Presentation

The Polish FabSpace is operated by OPEGIEKA and the Warsaw University of Technology. An academic institution of higher learning the Warsaw University of Technology, set up in Warsaw in 1826 provides 36 fields of study on 19 faculties and one college. It has about 37 thousand students and Ph.D. students. The many generations of engineers it turned out and its significant contributions to the development of technical sciences earned the Warsaw University of Technology an acclaimed position in the country as well as international renown. The Warsaw University of Technology, recognized in Europe and around the world, is steadily increasing its contribution to international educational and research projects, providing a mutually complementary educational and research package.

The Warsaw University of Technology cooperates closely with OPEGIEKA, which is a business partner in FabSpace 2.0 project. OPEGIEKA is a leading geomatics company in Poland. Holding a status of research and development centre, it is uniquely positioned to serve as an innovation hub, bringing together students, researchers and businesses. OPEGIEKA hosts FabSpace services using high-end Data Center opened in 2012. This assures that the service is widely available. With over 25 years of experience on the geospatial market and being a founding member of the only geospatial cluster in Poland (Geopoli), OPEGIEKA takes advantage of its business contacts to network research, students and entrepreneurs with public authorities and business. Additionally, the experience of OPEGIEKAs staff in creating new business services, using EO data, IT competences, and searching for funds, helps new entrepreneurs to set up new business and search for funding.

The Polish FabSpace Lab acts as a free-access place and service, where students, researchers and external users can make use of a data platform, as well as design and test their own applications which have been set up in the Centre for Innovation and Technology Transfer Management of the Warsaw University of Technology (CZIiTT WUT). The Centre supports technology transfer and innovation management, as well as conducts innovative research projects in these areas.

5.2 Local Organization

The CLEF challenge was an additional challenge of the Hackathon "Miasto przyszlosci, city of dreams", which was organised by the Warsaw University of Technology and OPEGIEKA. Participation in the competition was open to students, researchers and other people, who, by means of using methods of gamification and open data, tried to develop a prototype game that solves one of the urban problems:

- Development of the Port of Prague
- Communication in Warsaw 'Mordor'
- Capital of the 22nd century
- Revitalisation of Plac Defilad (one of the main squares in Warsaw).

5.3 Participants and Results

The CLEF challenge was presented locally after test data release. A group of 5 people, who came to our FabSpace Lab, started working on the CLEF challenge with the support of FabSpace managers. They worked according to the assumptions and requirements set by the CLEF pilot task [1]. Finally, four teams started a 24-hour contest, one on CLEF challenge. During the hackathon, the teams had an opportunity to consult their approach and ideas with technical experts. Each team presented its project to a jury during a 10-minute presentation which took place at the end of the competition.

The assessment criteria for each project focused on the following aspects:

- use of data (Earth Observation Data, geospatial data, etc.)

- an innovative and original nature of the project (technological approach, product, service, technological and organisational, business model, social innovation)

- the expected benefits of the project (relevance of the project to major social issues, etc.)

After reviewing the competition purpose and available data, participants chose data from the optical Sentinel-2 imagery and radar Sentinel-1. Prior to working with satellite imagery and in order to benchmark their results and select the appropriate parameters for classification and masking, students counted the buildings by dots earlier dividing areas for several different types of area development using the QGIS Open Layers plugin. The areas were divided into 3 for the Zambia area: industrial, slums, houses and 1 for Uganda: rural buildings.

Working with optical images began with the implementation of atmospheric correction using the sen2cor center tool, which allowed the removal of the atmospheric effects from pixels value. They then used 10 m RGB channels to create a stacked image. In order to determine the number of buildings in optical images, they performed the unsupervised classification using the SNAP software. However, with the selection of different number of clusters the results were largely different from the number of buildings counted.

Railways approach to the number of buildings was done using Sentinel-1 GRD product. For urban area the backscattering is high, allowing only the pixels with the roofs to be separated from the image. Firstly, students pre-processing radar data, all operations were performed for VH polarization. Students analysing the histogram and using the Band Maths tool in SNAP set the mask for buildings only, the value chosen was one of the higher for the buildings to separate other elements. For areas with industrial buildings and homes, the pixel value in Band Maths turned out to be good, but in the case of slums not all buildings were designated, so students for slums performed the operations again by decreasing the pixel value and setting their masks separately. Then, for industrial and home buildings and for slums, the exported QGIS masks were subjected by mean shift-segmentation process. The assumption of students was to obtain the number of polygons in the attributes table equal to the number of buildings. In the case of industrial buildings and houses, a comparison of the number of objects to the previous one yielded satisfactory results. However in the case of slums, many of the polygons after the segmentation contained in average one slums 4 houses. Therefore, the number of buildings designated after the segmentation was multiplied by 4.

In the case of results obtained by students to estimate the number of buildings, radar imaging was more applicable. Optical data has been used to divide areas by type of building. The results obtained and their comparison to the number of buildings was very promising.

The representative of the CLEF team presented the concept of the solution concerning estimation of the population and he was qualified to participation in ImageCLEF 2017. He delivered the final result to CLEF challenge, but unfortunately resigned from submission of the working note papers.

6 Toulouse FabSpace at CLEF 2017

6.1 Presentation

The French FabSpace is operated by Aerospace Valley (AV) and Université Paul Sabatier (UPS) -project leader, which are the business and academic partners for France in FabSpace 2.0.

Aerospace Valley is a competitiveness cluster dedicated to aeronautics, space and embedded systems. Aerospace Valley quickly became a regional, national and international recognised cluster which has the ambition of creating, through its member's activities, up to 40,000 new jobs by 2025. Today Aerospace Valley gathers over 800 members from industry and research including amongst others more than 400 SMEs as well as large corporate groups and SMEs, major aerospace research establishments, engineering schools and local authorities, all working together to develop synergies propelling the sector into the future. The different positioning of Aerospace Valleys members is a key asset to promote technology transfer from research to industry thus bridging the gap between research and the marketplace.

The purpose of AV is to leverage the competitiveness and visibility of all its members, both on the national and international scene and to foster the development of collaborative initiatives. It provides a specific support to SMEs helping them to take part in collaborative projects with industry leaders, investors, and research organisations.

Since its creation in 1969, UPS has been expanding its offer of multidisciplinary education in the fields of science, health, engineering, technology and sports, developing one of the most important scientific research clusters in France. Centred on Toulouse, European space and aeronautics capital, UPS is a renowned European university with a global outlook. With almost 29 000 registered students, UPS is one of the leading French universities, in the quality of its teaching, the breadth of its scientific research and the number of students it attracts.

As one of the top research establishments in France, counting 2784 teachers and teacher-researchers along with 1510 researchers from national and research bodies divided up into 72 laboratories, UPS is active in public research at the highest level. The Institut de Recherche e Informatique de Toulouse is one of the pillars of research in Computer Science in Midi-Pyrénées region, with 270 researchers and research professors, on a global workforce of 700 people. Two teams have been implicated in the project: The "Generalized Information Systems" team (SIG) (Josiane Mothe) is specialized on structured, semi-structured and unstructured information processing (mainly textual information). The team develops methods, models and tools for efficient access to qualified and relevant information. The "Visual Objects from Reality To Expression" team (VORTEX) (Véronique Gaildrat) is organized in four thematic groups whose overall research topic is the acquisition, treatment, behaviour and visualization of 3D visual objects.

The French FabSpace is located in the Université Paul Sabatier Catalyseur which aims at fostering innovation.

6.2 Participants and Results

The challenge was presented locally to people interested in the domain of Remote Sensing after having spread the information locally both at the university and through Aerospace Valley network. A group of 4 persons with different background was constituted. The local group met twice but it was not possible to continue the work due to their lack of time availability. During the meetings, the local organizers provided aid with the use of remote sensing tools such as QGIS and Orfeo ToolBox. The members of the team were beginners in Remote Sensing analysis and lacked the expertise to elaborate a sophisticated methodology. The local organizers offered training in some of the available tools (QGIS, Sentinel Tool Box and Orfeo Tool Box). Unfortunately, the participants were not able to submit a solution for the challenge.

The local organizers looked for alternative teams and managed to capture the attention of two potential teams. The first team was based in France and included a researcher on the population estimation using remote sensing. This person seemed interested, he indicated that he successfully register in the challenge website. However, local organizers have not received any submission from him. A second team that showed interest was based on Spain. However, only an initial contact was made.

6.3 Discussion

The participants and the French FabSpace had a nice collaboration and at the beginning the participants had a great motivation. However, the participants could not reach to the final point. All the participants are willing to connected with the French FabSpace for their future activity and also looking forward to the next year ImageCLEF event.

7 Conclusion

In this paper, we present the FabSpaces' participation to ImageCLEF 2017, estimating population pilot task. Within this network of Universities and companies, we organized this participation as an open contest like hackathon. While FabSpace 2.0 H2020 project promotes highly interdisciplinary teams, it was clear that in this challenge skills in satellite imagery processing and knowledge on earth observation and geo-spatial technologies was mandatory. Several teams were constituted but only 4 of them completed the task from the six FabSpaces in Europe. The results obtained show that although some solutions can be used, there is still room for improvement using freely accessible but low resolution satellite images for estimating population. Moreover, this task approached some new and sophisticated methodologies as fusion between supervised and unsupervised classification, fusion between radar and optical imagery, and Convolutional Neural Network (CNN) which need more precise screening to draw better results.

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