**Objective**: estimate cumulative NDVI (and deviation from LTA) at EOS with ANN

**Target**: EOS NDVI anomaly, Crop yield from FAO?

**Spatial extent:** Africa or word?

**Granularity:** pixel based?

**Input**: location characteristics (eco-climatology, climatology, soil), NDVI and METEO observed so far, meteo forecasts

**Variable selection:** all variables having at least 0.2 of r

**General architecture**:   
OPT1: one ANN per pheno phase (5 phases in total). Phase X is trained over NDVI variables belonging to phase 1 to X (i.e. the ANN of phase 4 sees variables of phases 1 to 4) and meteo variables of all phases (future phases are filled with forecasts or LTA: next 32 days is ENS extended, next 183 days is SEAS, after is LTA).

OPT2: single ANN with future NDVI filled with LTA? In this case the ANN should see in which phase it is and decide to what extent LTA has to be used. If prct are used it is always 50%.

Should we provide meteo as anomaly or physical values? With anomalies the ANN may associate that 0 anomaly in weather forecast means 0 anomaly in EOS NDVI. With physical values the NN has to “discover” that a given P is causing/not causing a deficit in different settings.

How can we take into account the uncertainty in some input variables (e.g. weather forecasts)?

How can we model uncertainty? Can we have an additional ANN that is trained with the same data over the RMSE in prediction of the estimation ANN? It does not make sense, if an ANN can predict the error one can use it for a better prediction.

How catagorial variable can be treated in ANN? Binary encoding: for instance one variable per each soil type, all set 0 expect the one of the soil at location, set to 1. Or One of N encoding (see Matlab documentation, soil 1 is [1 0 0 0 0 0 0], soil 2 is [0 1 0 0 0 0 0] and so on.

Phases can be coded from 1 to 4.

What about irrigated crops (where climate has no influence)?

What if we provide lat lon as well to the NN?

**Output variables**

zNDVIc (or non parametric percentile of NDVIc in HIS), Better the percentile that make no assumption and is already 0-1

**Pheno events**

1-SOS, 2-MG (mid-growth, middle point between SOS and TOM), 3-TOM, 4-SEN, 5-EOS

**Input variables**

|  |  |  |
| --- | --- | --- |
|  |  |  |
| PP (Pheno phase) | Initial Growth (SOS2MG); Growth (MG2TOM); Senescence (TOM2SEN); Late Senescence (SEN2EOS) |  |
| Prct of cumulative precipitation (1 month) before SOS |  |  |
| **Pheno-phase specific variables (each of the following is given per pheno-phase)** | | |
| prct NDVic | Future phase replaced by LTA |  |
| Prct of cumulative precipitation over the phase | Future phase replaced by forecasts and the LTA |  |
| Prct of Consecutive days of dry spell |  |  |
| Prct of median Tair |  |  |
| Prct of median Incident radiation |  |  |
| Length of the pheno phase (in % of full length) |  |  |
| SWI |  |  |
| WSI |  |  |
| Oscillation Indexes, ENSO, ONI, what else? |  |  |
| Weather forecst? NUT ECMWF not very good for Prec in ou zones |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| **Location specific variables** | | |
| Soil type | Not implemented for now |  |
| Eco-clim zones | Use of GAES strata |  |
| AFI crop |  | Use current ASAP ones but update when the new ANA’s products are available |
| AFI rangeland |  |  |
| Mean T of the season | Season climatology |  |
| As above, SD |  |  |
| Mean P of the season |  |  |
| As above, SD |  |  |
| Mean Rad of the season |  |  |
| As above, SD |  |  |
| Mean NDVI of the season |  |  |
| As above, SD |  |  |

Data sources

|  |  |  |
| --- | --- | --- |
| Var | Source | Location |
| NDVI | Boku | Various at the moment.. |
| Precipitation (SPI1 and 3) | CHIRPS |  |
| Pheno | Temporarily from SPIRITS, when ready from my model | Y:\remote\_sensing\boku\Pheno\_17-01-2017\PhenoV2\Filtered\_seasonality |
|  | Pheno365 |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Mask to be used:**

|  |  |
| --- | --- |
| E:\WA MODIS\masks\ ROI\_5EcoRegions.img | WWF five ecoregions in WA |
|  | Phenology monomodal |
|  |  |
|  |  |

Ha senso lavorare con I percentile e non con I valori assouti? Magari bisogna provare tutte e due le cose..