



GOOSE

An internet of connected sensors

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TNO: founded in a time of crisis (1932)

- Caters to industry and government needs for specific R&D
- Independent of public and private interests



1937
TNO Food
and Nutrition
organisation



1932
Founding of
Central TNO
organisation

1943
TNO
Agriculture
Industry
organisation
*discontinued
in 1951*

1946
TNO State
Defence
organisation



1950
TNO Health
organisation

1981
Discontinuation of
4 separate
organisations.
Establishment of
7 main groups



2005
Discontinuation
of institutes.
Establishment of
five core areas

2011
Discontinuation of five
core areas.
Theme-based
project organisation
with 3 expertise centres

1993
Discontinuation of
main groups.
Establishment of
institutes

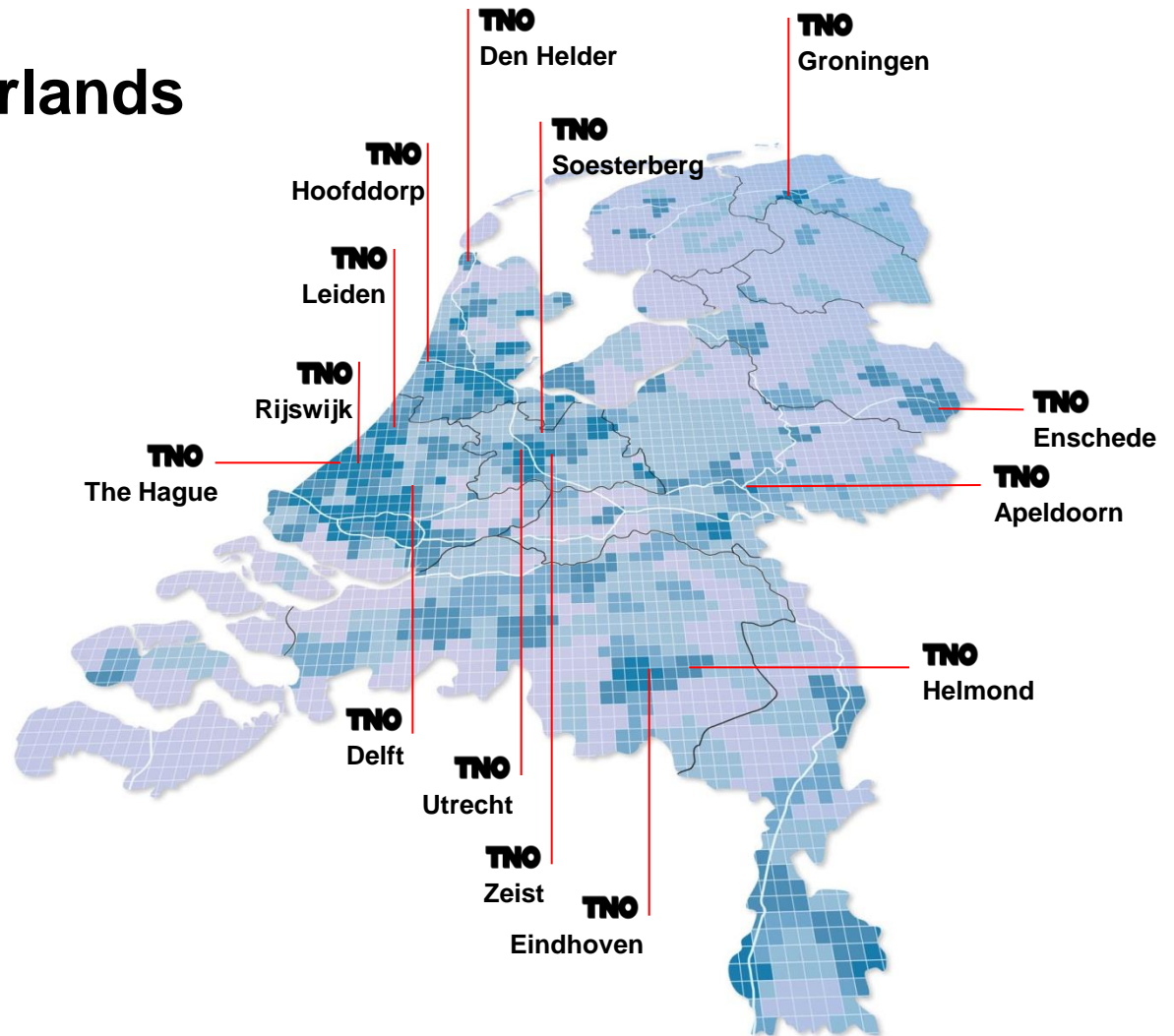


Themes and innovation areas



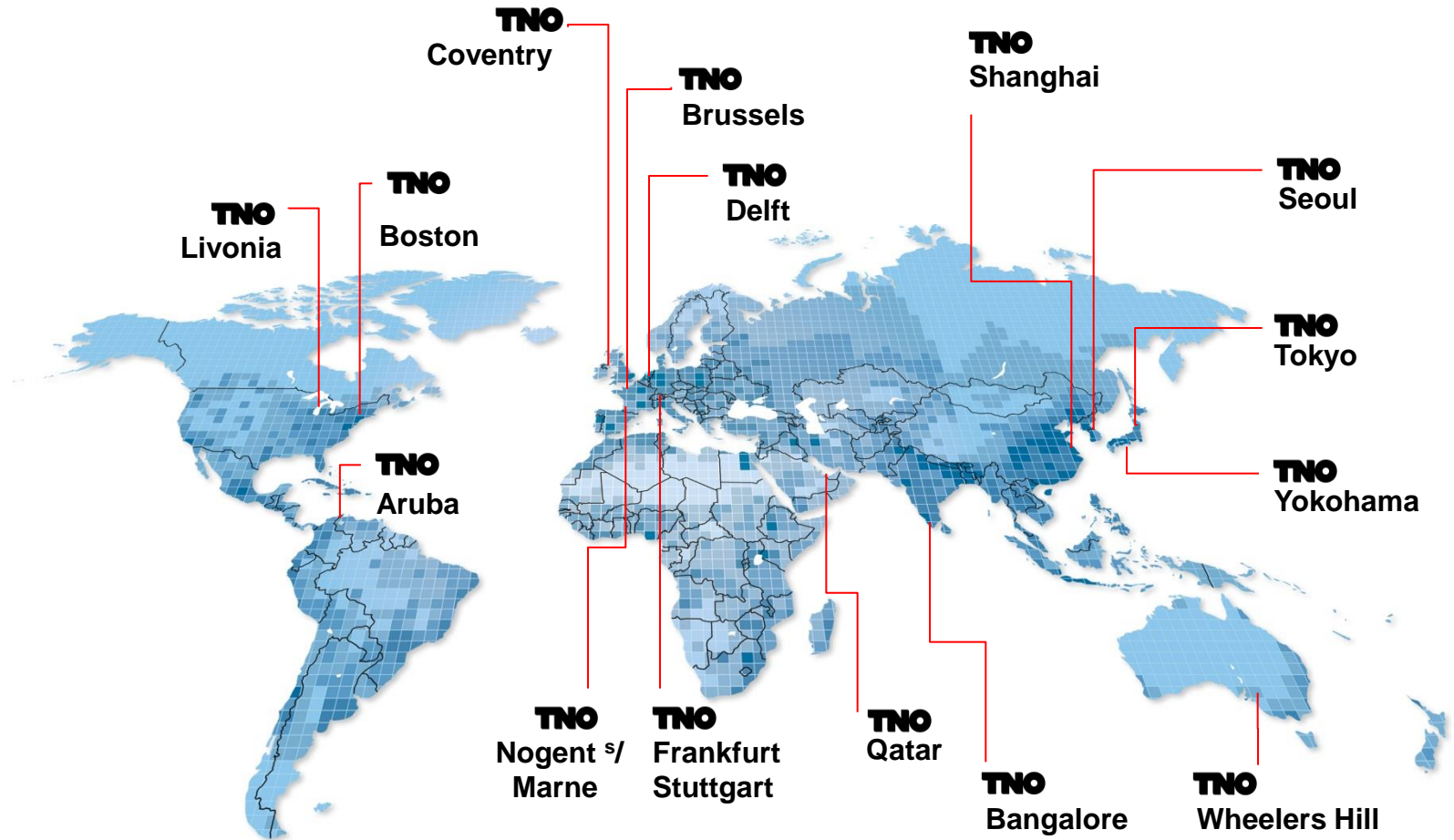


TNO in The Netherlands





TNO Globally





The power of TNO

From idea to innovation

Develop
fundamental
knowledge

Knowledge
development

Knowledge
application

Knowledge
exploitation

With
universities



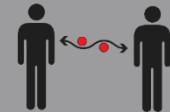
With
partners



With
customers



Embedded in the
market



- Spin-off companies



GOOSE – Internet of connected sensors

Ambitious Vision

A GOOSE system links user queries to **information** from all web based **sensors** to deliver the **right answers** at the **right moment** to **any user**



GOOSE in context

- › In 2012: Program started
 - › Collaboration between ETP AMSN, Defence and ICT.
- › Collaboration:
 - › iCore : Coupled with FP7 project to empower Internet of Things with cognitive technologies
 - › CORTEX : DARPA Mind's Eye Program / Action recognition.



CORTEX publications:
Conferences: CVPR, ICPR, ECCV,
SPIE, ICPRAM, AVSS, SSPR
Journals: PRL, MVA, ICPRAI,





DARPA Mind's Eye Program

Visual intelligence: Action recognition challenge

throw
pass walk
replace flee carry exchange
hit enter fall dig pickup
receive fly snatch collide attach touch
take stop arrive go have open hold leave
follow bury bounce catch drop hand
move approach give get push
raise exit close haul kick run
lift chase jump putdown
turn





T447 E17 (person)



Track (47ed733b)
Segment (40b7a6a7)
hold
approach
stop
pickup
Segment (4f255cd9)
carry
Segment (5c5532b9)
follow
Segment (7be6f9c7)
take

T92 E10 (person)



Track (68b329da)
Segment (44eea3e4)
approach
Segment (94ce59a1)
carry
Segment (e1c06d85)
follow
Segment (1a517e43)
take

T500 E16 (person)



Track (6b31bdfa)
Segment (2a091c1f)
approach
pickup
Segment (0ba4067c)
bury
stop
hold
walk
follow
putdown
Segment (1e379fd1)
carry



Evaluation on Year-1 dataset of Mind's Eye

Year 2: improvement track

Method	Ref
Baseline: EP+STIP, single stage SVM	[SPIE 2012]
Spatio-temporal layout	[PRL 2013]
STIP + two stage SVM	[ICPR 2012]
Soft assignment RF	[IJPRAI 2013]
EP+STIP, two stage SVM, selective sampling	[MVAP 2013]
Our advanced pipeline combining all above	[SPIE 2013]

3.4 times better
than last year

42% better than
most recent
state-of-the-art



GOOSE:

- Many different sensors
- Many different users
- Many different queries
- Instant situation awareness



Big Technology Issues

› **Scalability**

- › The ability to handle the growing amount of sensors and users

› **Semantic gap**

- › To translate free text queries into something that the system understands



› **Prototype query**

“Pink Cadillac in Amsterdam”



pink cadillac

Klamer Schutte 0 + Share

Web Images Maps Shopping More Search tools

Safe Search Settings

Related searches: [elvis pink cadillac](#) [pink cadillac convertible](#) [mary kay pink cadillac](#) [hot pink cadillac](#) [pink cadillac movie](#)





pink cadillac in amsterdam

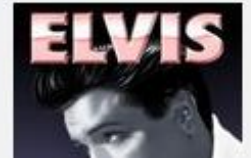
Klamer Schutte

+ Share

Web Images Maps Shopping More Search tools



Google:
Search on the internet.





Firefox

Goose

goose.tno.nl/goose/#

Goose

approaching white dog

Search

approach

Action approach

white

Color white


dog

Results: 1 to 3 of total: 3

Order by: [Date descending](#) [Date ascending](#) [Relevance score](#) [Duration](#)


1

FL000000054: 2013-04-09 (10:51 - 10:51)

 [00:01 - 00:01](#) No text available

[00:06 - 00:06](#) No text available

FL000000020: 2013-04-09 (10:57 - 10:58)

 [00:01 - 00:01](#) No text available

[00:01 - 00:01](#) No text available

[00:02 - 00:02](#) No text available

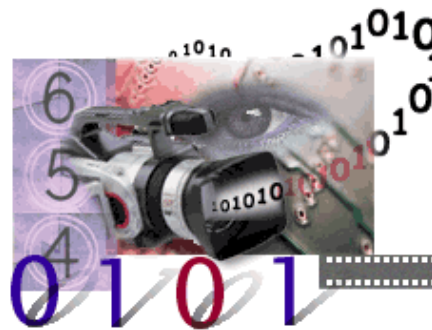
GOOSE:
Search in 'all' sensors.



Goal of 2012 TRECVID Multimedia Event Detection



- › TRECVID: Challenging international benchmark.
- › Aim: Automatically determine whether an event is present in a video.
- › Evaluation 2013: 20 "pre-specified" + 20 new "ad-hoc" event kits (queries) containing 100, 10 or 0 event videos and a text description.
- › Database contains 98,000 search videos (6000 hours).



**DIGITAL VIDEO
RETRIEVAL
at
NIST**



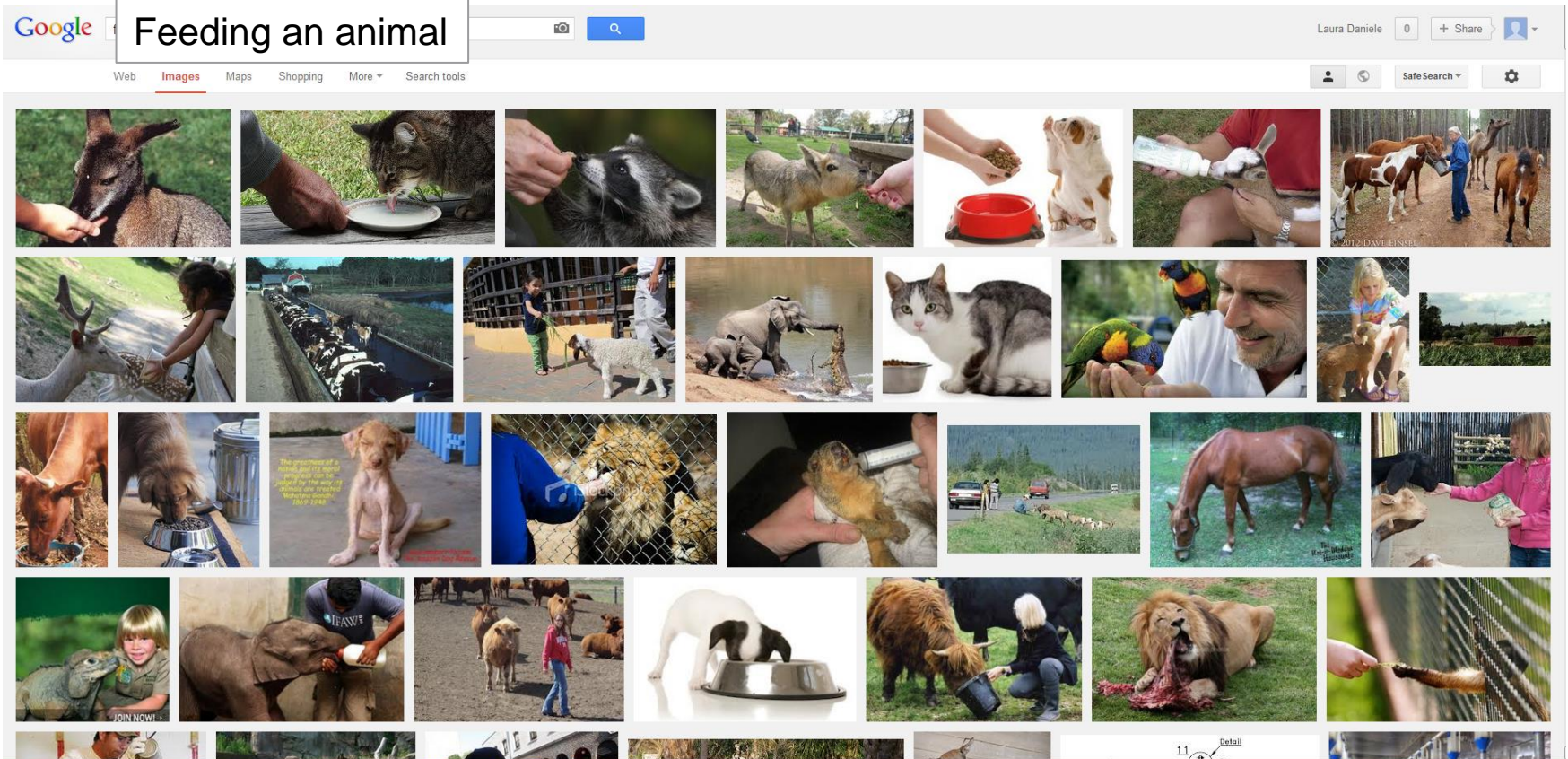


Semantic reasoning

- › Systematic analysis of queries (events) using several approaches:
 - › Query by example (Google images)
 - › Query expansion (e.g. of “feeding an animal...”)
 - › Synonyms (e.g., “giving food to an animal”)
 - › Subordinate relations (e.g., “feeding a cat”)
 - › Part-whole relations (e.g., “feeding mouth of an animal”)
- › Approaches can be used individually or in combination
- › Expanded queries can be used for better results from Google images
- › From specific queries we extract generic guidelines for other queries



Query by example using Google images





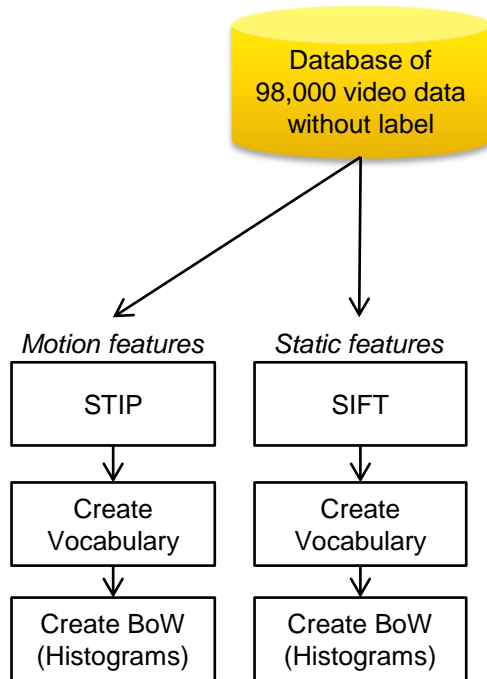
Query expansion

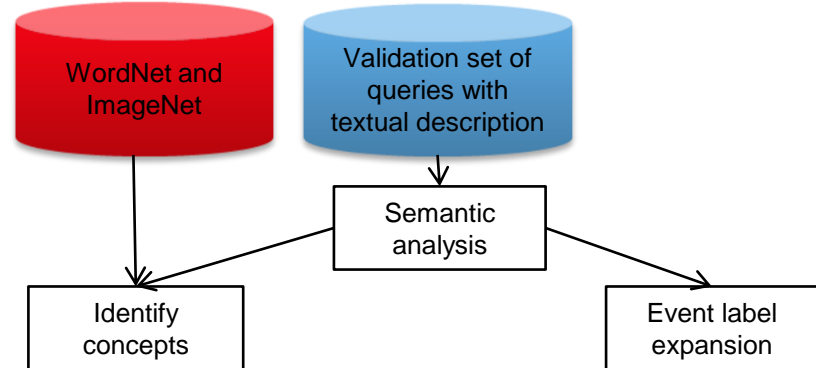
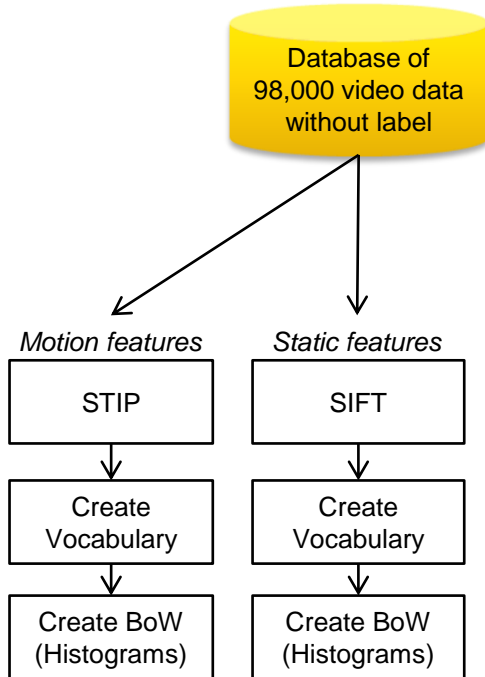
Feeding a cat

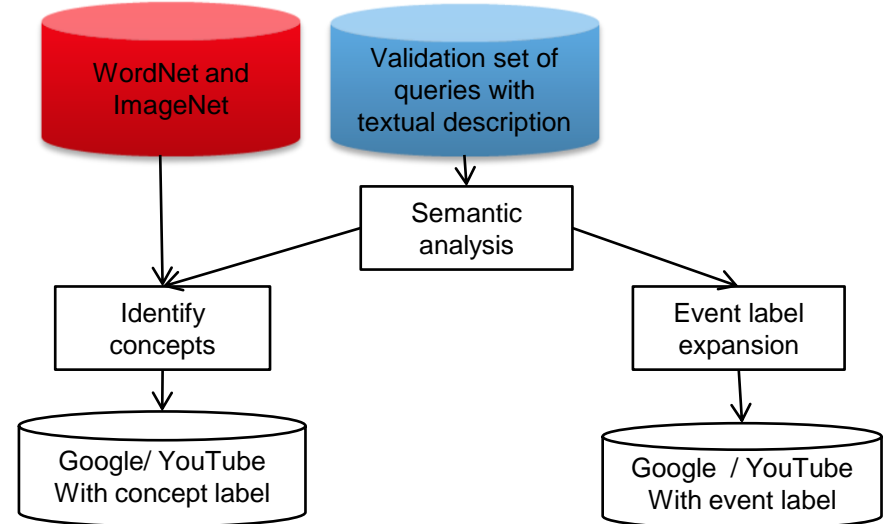
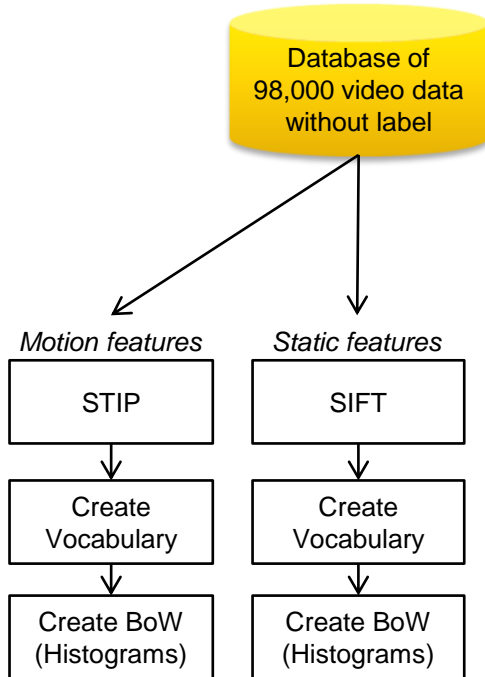


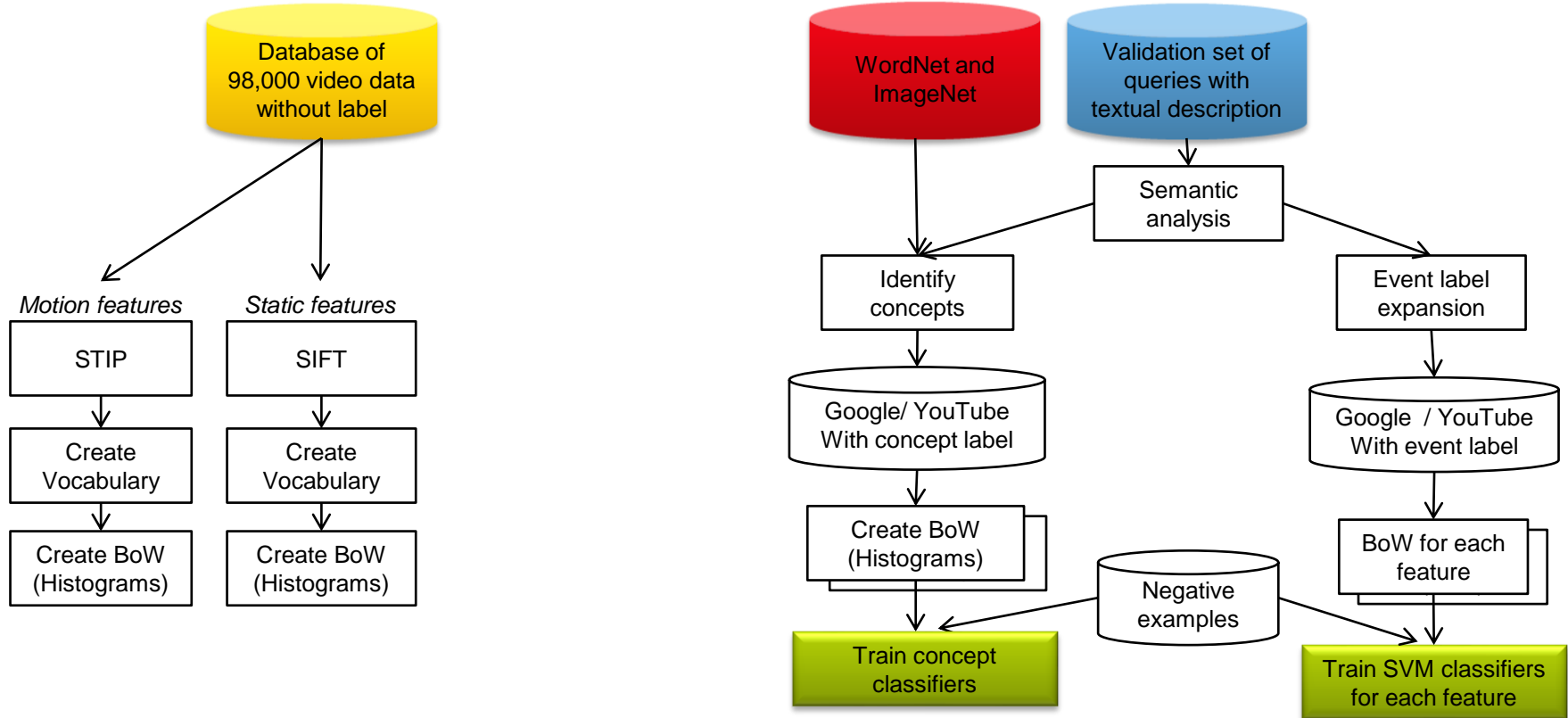
Feeding a dog

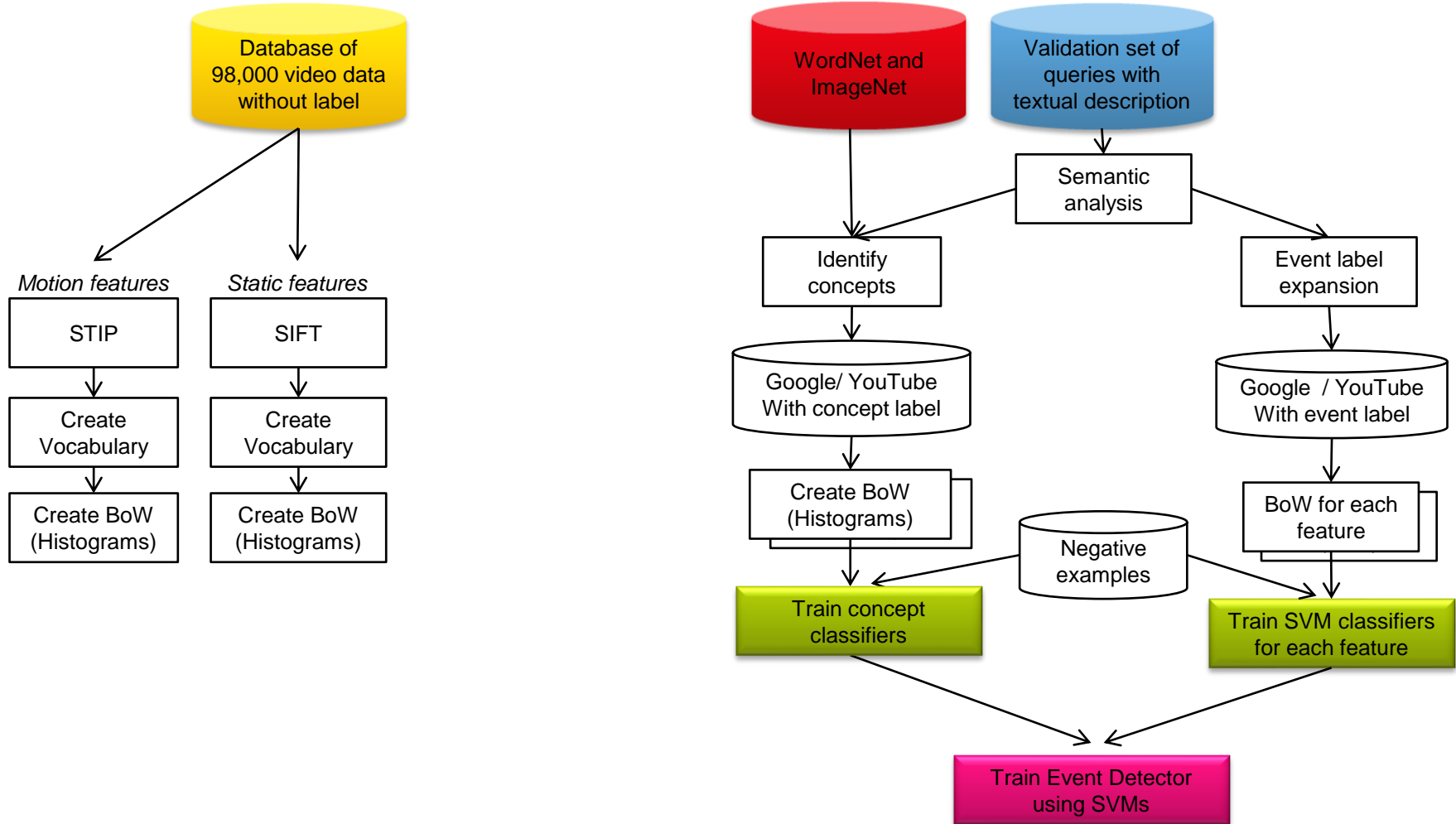


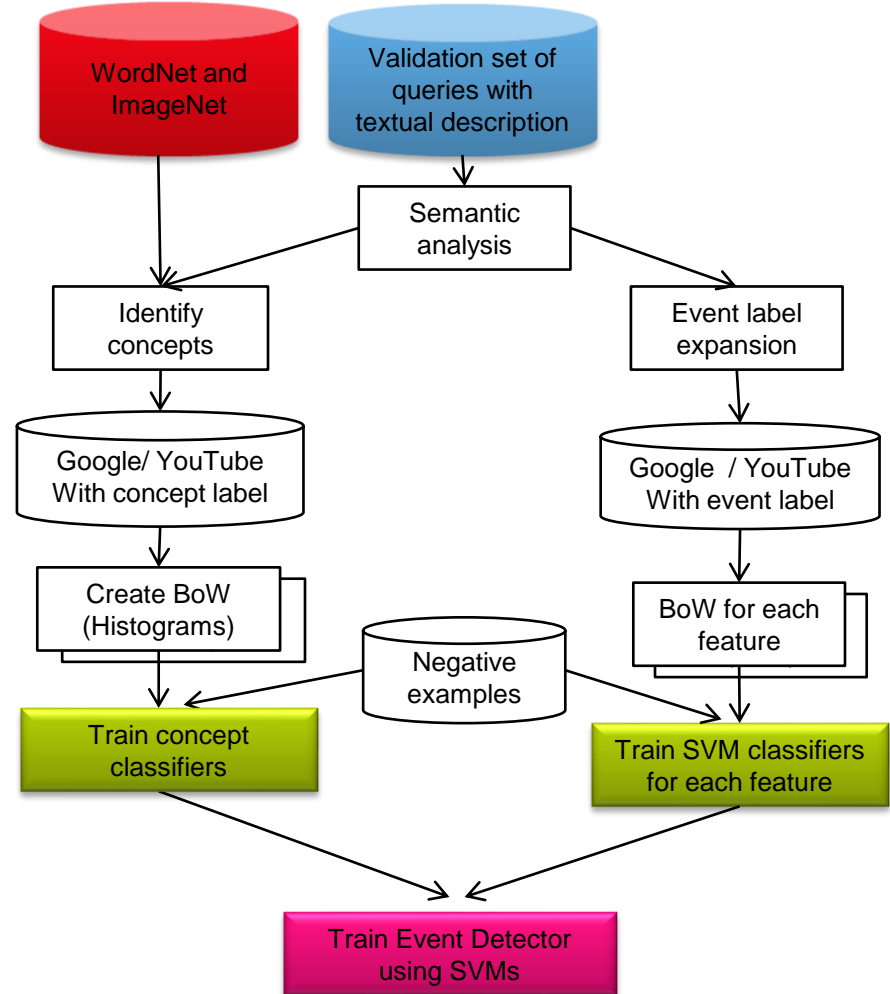
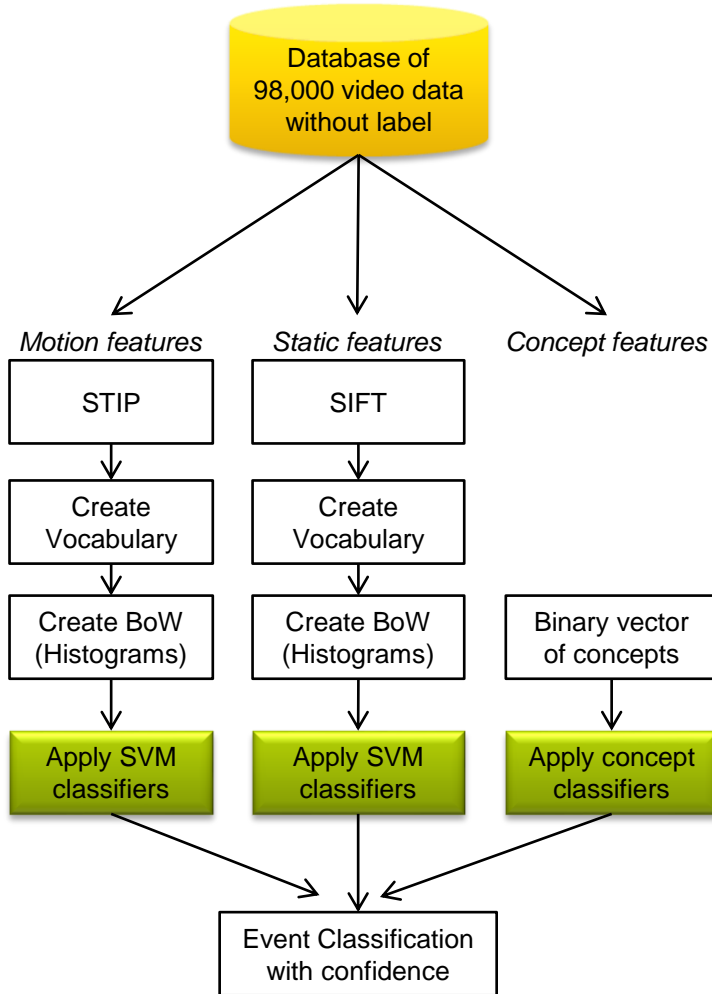


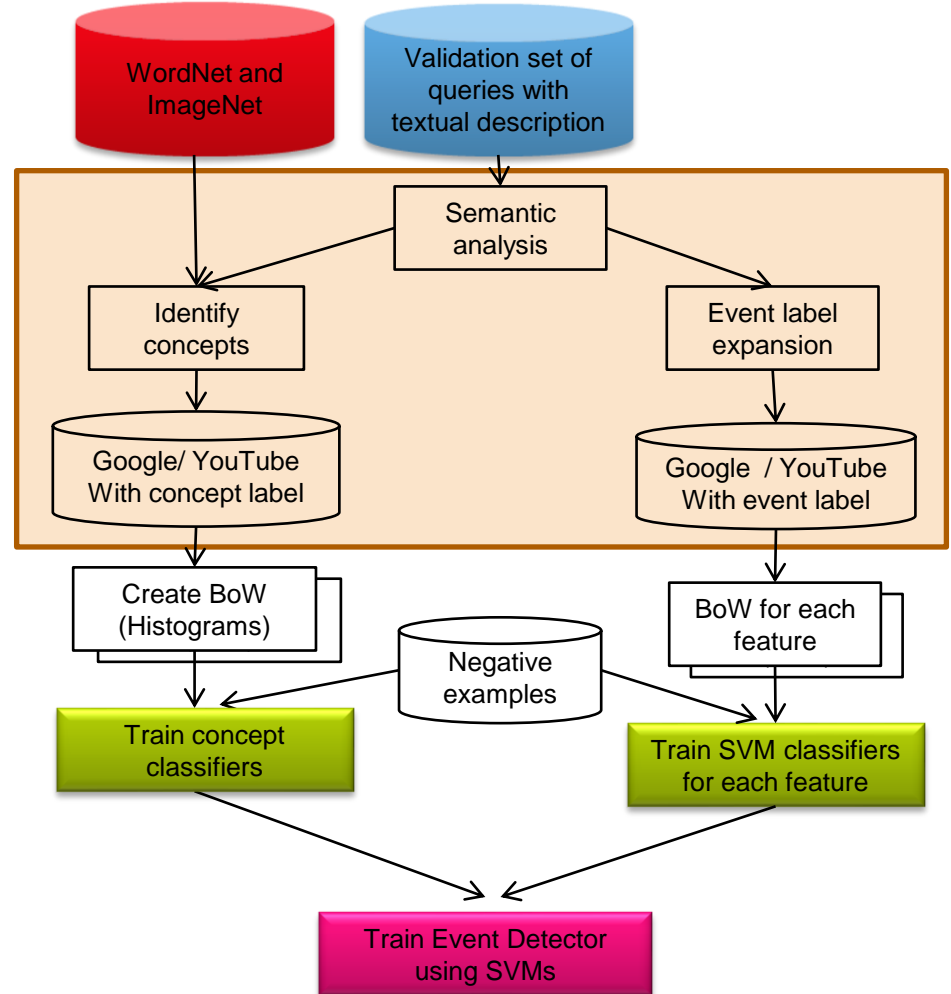
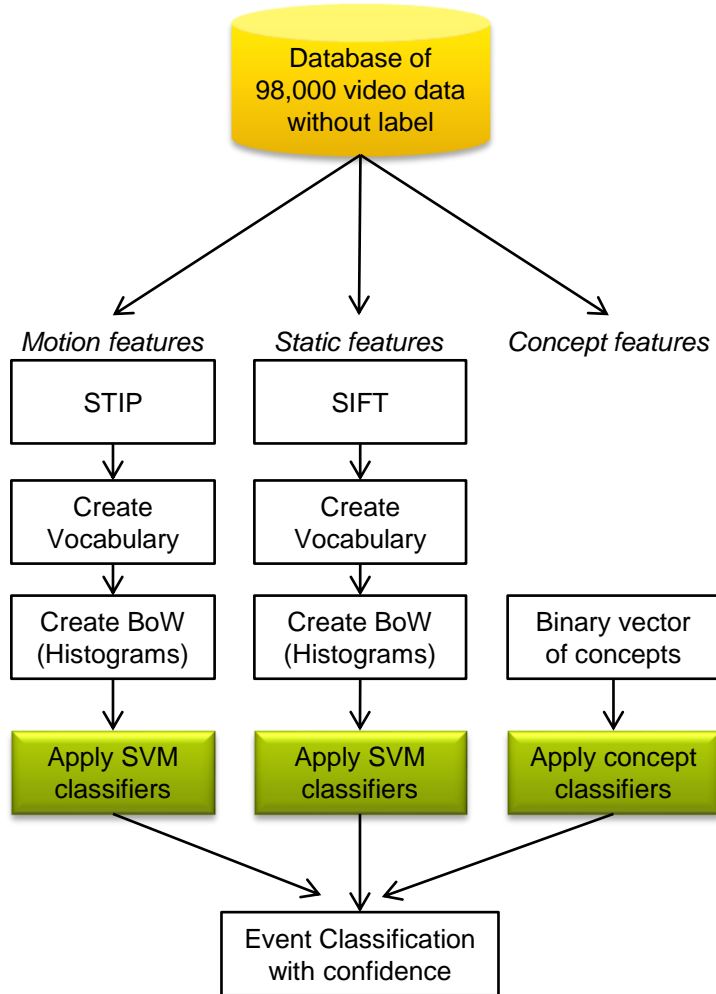














GOOSE: Semantic search in 'all' sensor streams

- › GOOSE = flexible, scalable, semantic search in 'all' sensors.
- › A lot of work to do ...
- › *Ambitious goals... aiming for the top!*





Conclusion

- › Full life-cycle of research and development
- › Involved in many research projects
- › Close relationships with Universities and companies
- › Open for opportunities to collaborate in research projects



Thank You!

Team

